Appendix B-2

Assessment of Individual MSW Landfill Site Characteristics By Gas Enforcement Action Status

Results statements in this appendix are based on the study's Task 2 database inventory, which contains data on the 224 MSW landfills studied.

Site Characteristic (Independent Variable)

Owner Type

Value and Number of Landfills

Public: 168
Private: 56

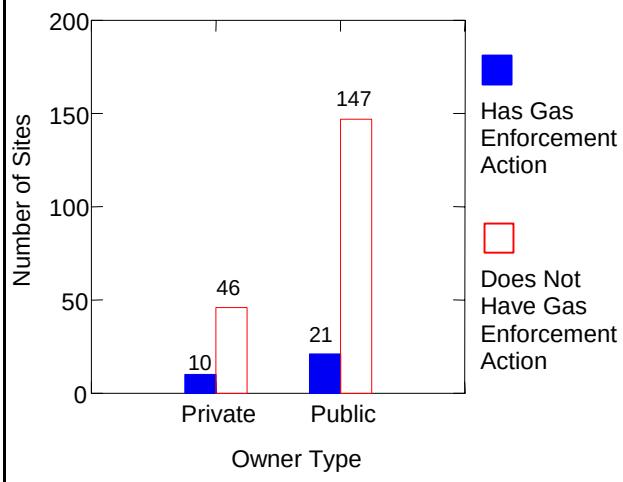
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: "Has Gas Enforcement Action" or "Does Not Have Gas Enforcement Action")

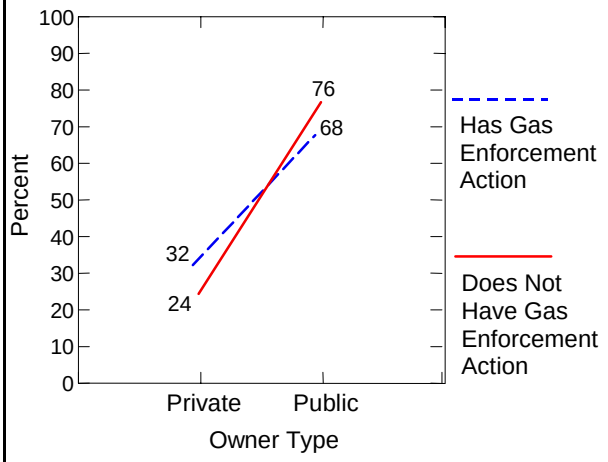
Summary Table Results—Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Independent Variable Reference Value	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Private	Public	0.317	1.522	3.464	0.668

Number of Sites in Each Gas Enforcement Action Category by Owner Type



Percent of Sites in Each Gas Enforcement Action Category by Owner Type



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Owner type does not increase or decrease the likelihood that a site is in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Physical Setting

Value and Number of Landfills

Inland: 119
Desert: 58
Coastal: 17
Alpine: 13
High Desert: 9
Estuarine: 8

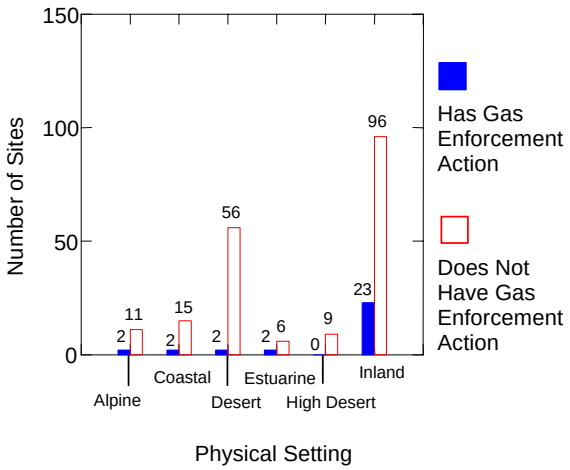
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

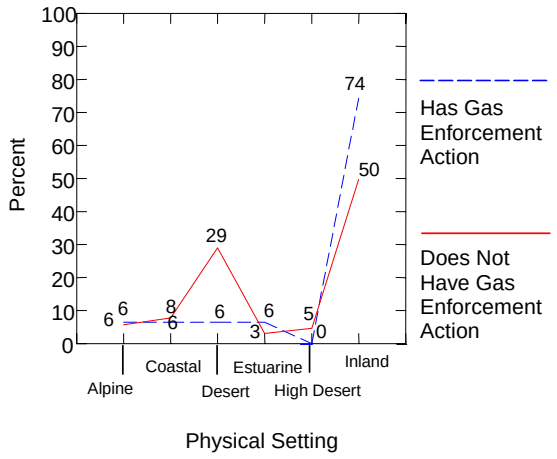
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Has Gas Enforcement Action")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
High Desert	Inland	NA	NA	NA	NA
Desert	**Inland**	**0.012**	**6.708**	**29.525**	**1.524**
Alpine	Inland	0.731	1.318	6.358	0.273
Coastal	Inland	0.457	1.797	8.415	0.384
Estuarine	Inland	0.697	0.719	3.794	0.136

Number of Sites in Each Gas Enforcement Action Category by Physical Setting



Percent of Sites in Each Gas Enforcement Action Category by Physical Setting



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

It is approximately 6.7 times less likely that a desert site is in the category "Has Gas Enforcement Action" than an inland site. No other physical settings increase or decrease the likelihood that a site is in the category "Has Gas Enforcement Action". Based on the available data, none of the high desert sites are in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Social Setting

Value and Number of Landfills

Rural: 139
Urban: 71
Suburban: 14

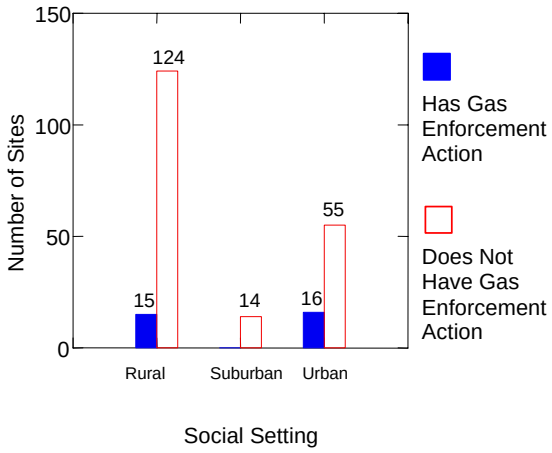
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

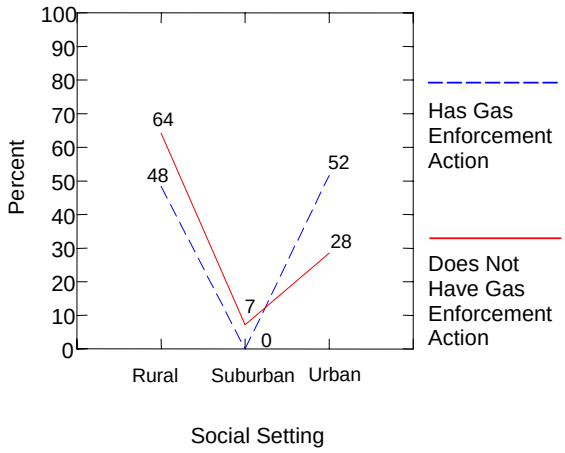
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Urban	Rural	0.026	2.405	5.208	1.111
Suburban	Rural	NA	NA	NA	NA

Number of Sites in Each Gas Enforcement Action Category by Social Setting



Percent of Sites in Each Gas Enforcement Action Category by Social Setting



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

It is approximately 2.4 times more likely that an urban site is in the category "Has Gas Enforcement Action" than a rural site. None of the suburban sites are in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Minimum Depth to Underlying Groundwater

Value and Number of Landfills

Continuous

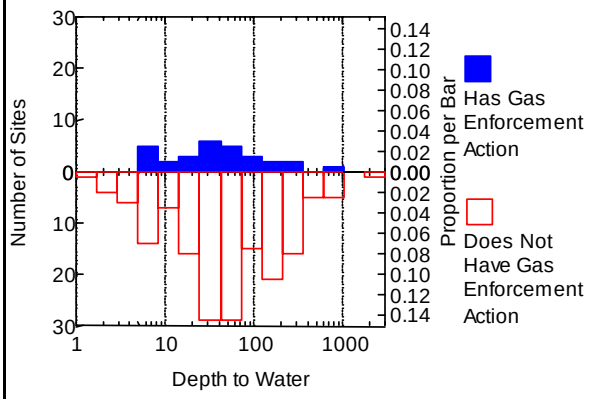
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

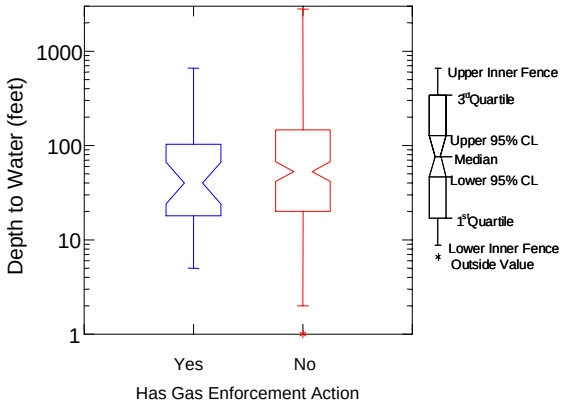
Summary Table of Results – Logistic Regression (Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Minimum Depth to Underlying Groundwater	0.984

Log-Scale Frequency Diagram of Depth to Water by Gas Enforcement Action Category



Box-and-Whisker Plot of Depth to Water by Gas Enforcement Action Category



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is not a statistically significant difference in depth to water whether a site is in the category “Has Gas Enforcement Action” or “Does Not Have Gas Enforcement Action.”

Site Characteristic (Independent Variable)

Underlying Geologic Material

Value and Number of Landfills

Sand and/or Gravel: 95
Silts/Clays: 62
Sedimentary Rock: 51
Igneous Rock: 16

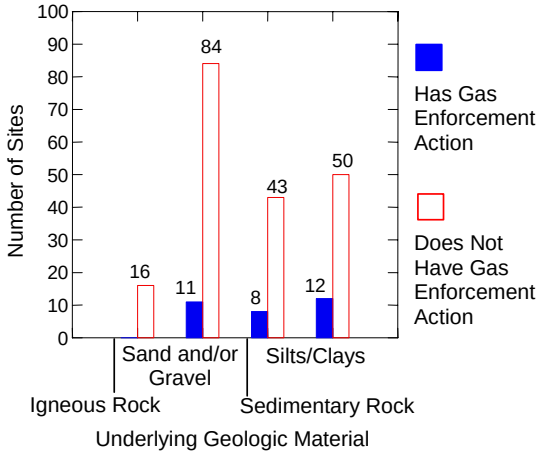
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

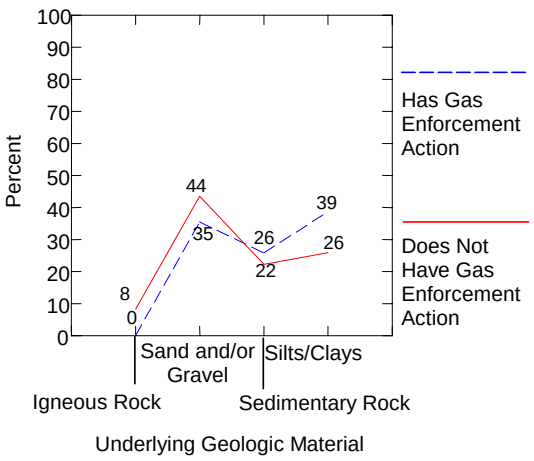
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Igneous Rock	Sand and/or Gravel	NA	NA	NA	NA
Sedimentary Rock	Sand and/or Gravel	0.483	1.421	3.793	0.532
Silts/Clays	Sand and/or Gravel	0.182	1.833	4.462	0.753

Number of Sites in Each Gas Enforcement Action Category by Underlying Geologic Material



Percent of Sites in Each Gas Enforcement Action Category by Underlying Geologic Material



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

The underlying geologic material does not increase or decrease the likelihood that a site is in the category "Has Gas Enforcement Action." None of the igneous rock sites are in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Average Annual Precipitation

Value and Number of Landfills

Continuous

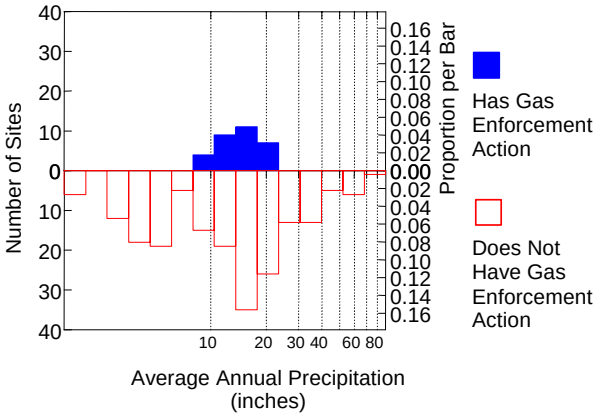
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

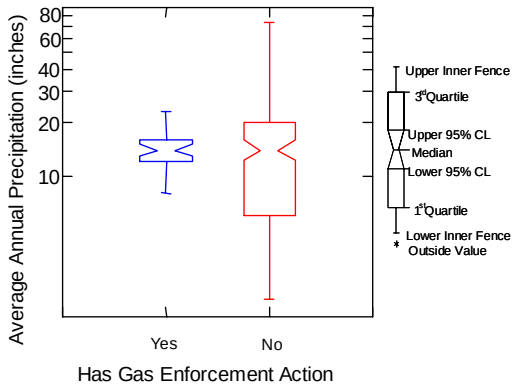
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Average Annual Precipitation	0. 384

Log-Scale Frequency Diagram of Average Annual Precipitation by Enforcement Action Category



Box-and-Whisker Plot of Average Annual Precipitation by Enforcement Action Category



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is not a statistically significant difference in average annual precipitation whether a site is in the category “Has Gas Enforcement Action” or “Does Not Have Gas Enforcement Action.”

Site Characteristic (Independent Variable)

Landfill Gas Collection System

Value and Number of Landfills

Yes: 103
No: 121

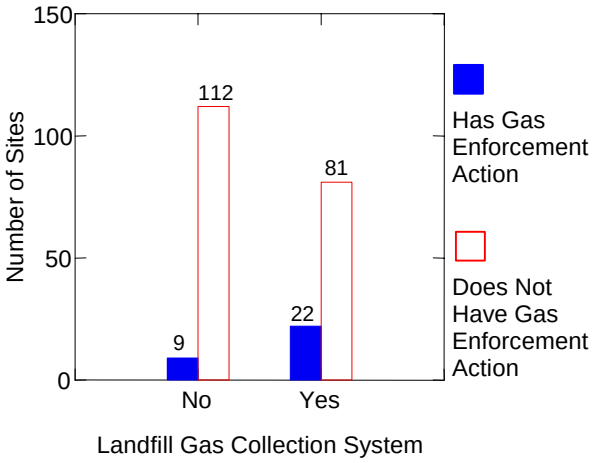
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

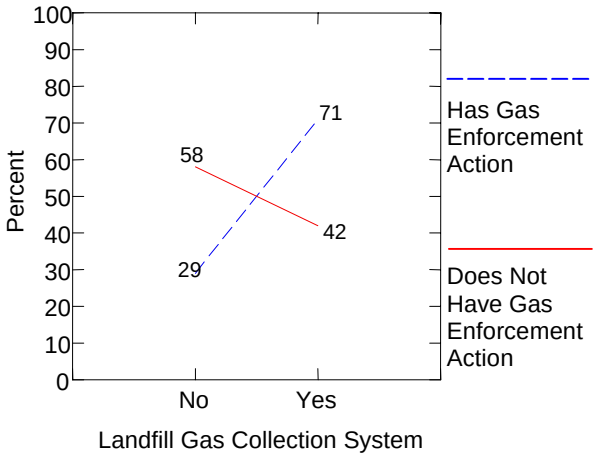
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Yes (have landfill gas monitoring)	No (do not have landfill gas monitoring)	0.004	3.38	7.725	1.479

Number of Sites in Each Gas Enforcement Action Category by Landfill Gas Collection System



Percent of Sites in Each Gas Enforcement Action Category by Landfill Gas Collection System



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

It is approximately 3.4 times more likely that sites with landfill gas collection systems are in the category "Has Gas Enforcement Action" than those that do not have landfill gas collection systems.

Site Characteristic (Independent Variable)

Landfill Size (Permitted Disposal Area)

Value and Number of Landfills

Continuous

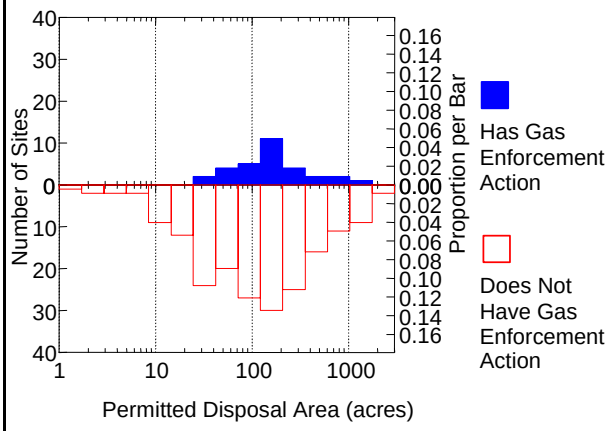
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

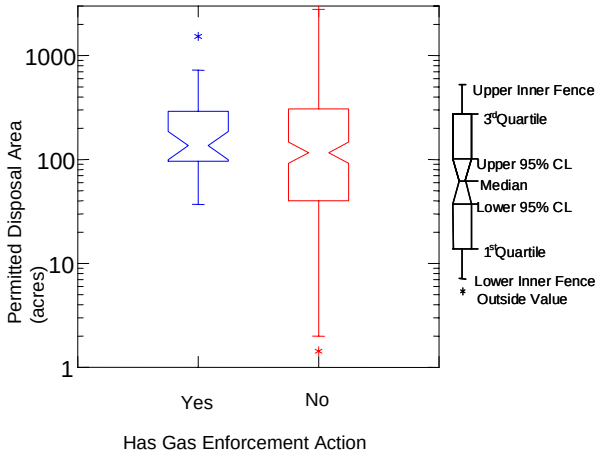
Summary Table of Results
(Kruskal-Wallis Analysis of Variance

Independent Variable Category	Probability
Permitted Disposal Area	0.199

Log-Scale Frequency Diagram of Permitted Disposal Area By Gas Enforcement Action Category



Box-and-Whisker Plot of Permitted Disposal Area by Gas Enforcement Area Category



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is no statistically significant difference between the permitted disposal area of landfills that are in the category “Has Gas Enforcement Action” and of those that are in the category “Does Not Have Gas Enforcement Action.”

Site Characteristic (Independent Variable)

Liner Type (Whole Site)

Value and Number of Landfills

Completely Subtitle-D* or Subtitle-D Alternative: 4
Fully Lined, Partially non-Subtitle-D or non-Subtitle-D Alternative: 12
Partially Unlined: 70
Fully Unlined: 138

*Also referred to as "Sub-D."

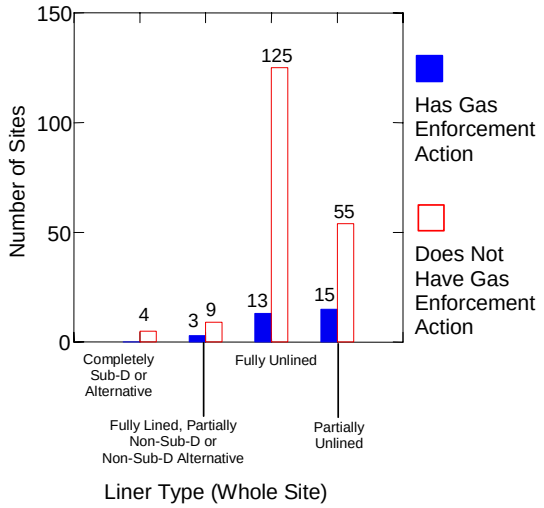
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

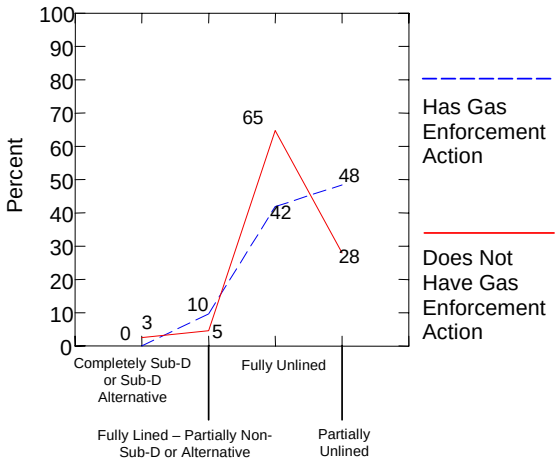
Summary Table of Results – Logistic Regression (Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Subtitle-D or Subtitle-D alternative	Fully Unlined	NA	NA	NA	NA
Fully Lined, partially non-Subtitle-D or non-Subtitle-D alternative	Fully Unlined	0.109	3.205	13.34	0.77
Partially Unlined	**Fully Unlined**	**0.017**	**2.67**	**5.994**	**1.19**

Number of Sites in Each Gas Enforcement Action Category by Liner Type (Whole Site)



Percent of Sites in Each Gas Enforcement Action Category by Liner Type (Whole Site)



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

It is approximately 2.7 times more likely that a partially unlined site is in the category "Has Gas Enforcement Action" than a site that is fully unlined. No other liner category increases or decreases the likelihood that a site is in the category "Has Gas Enforcement Action" relative to fully unlined sites. Based on the available data, none of the completely Sub-D or Sub-D alternative sites are in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Cover Type (Whole Site)

Value and Number of Landfills

Completely Covered: 48
Partially Uncovered: 30
Completely Uncovered: 146

Environmental Performance

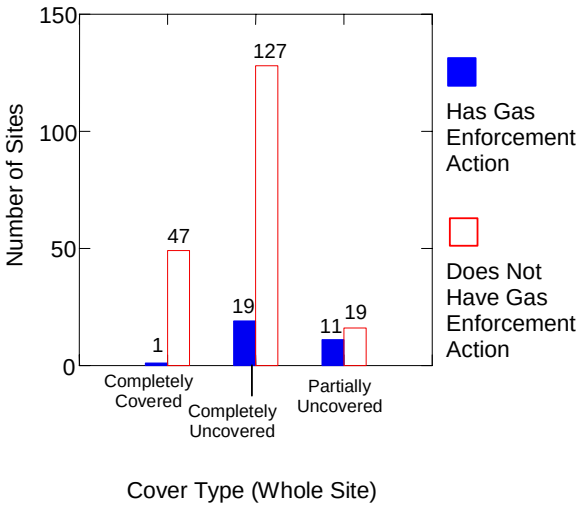
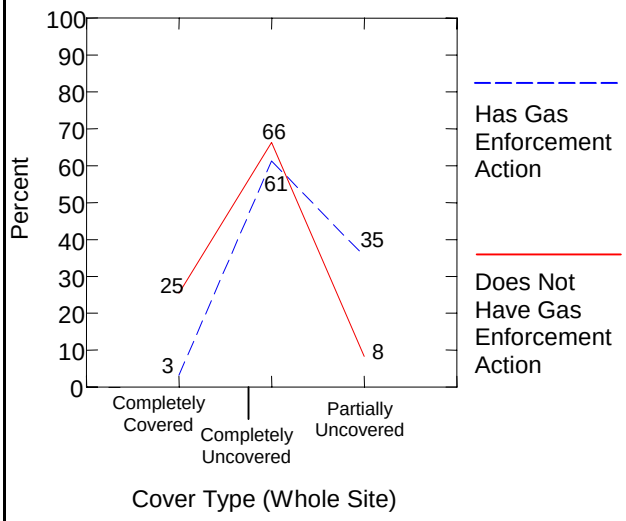
Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Covered	Fully Uncovered	0.0563	0.1375	1.055	0.0179
Partially Uncovered	**Fully Uncovered**	**0.00092**	**4.63**	**11.465**	**1.871**

Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Has Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Covered	Fully Uncovered	0.0563	7.273	55.804	0.948
Partially Uncovered	Fully Uncovered	0.00092	0.216	0.534	0.087

	Number of Sites in Each Gas Enforcement Action Category by Cover Type (Whole Site) 	**Percent of Sites in Each Gas Enforcement Action Category by Cover Type (Whole Site)** 
Variable Type for Statistical Analysis	Categorical Independent Variable	
Results Statement	It is approximately 4.6 times more likely that a partially uncovered site is in the category “Has Gas Enforcement Action” than a fully uncovered site. At a 95 percent significance level, the cover type does not increase or decrease the likelihood that a site is in the category “Has Gas Enforcement Action.” Under a 90 percent significance level, the results indicate a completely covered site is approximately 7.3 times less likely than a completely uncovered site to be in the category “Has Gas Enforcement Action.”	

Site Characteristic (Independent Variable)

Landfill Age

Value and Number of Landfills

Continuous

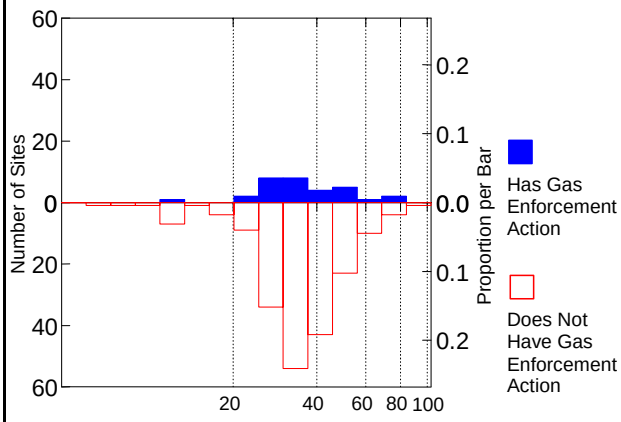
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

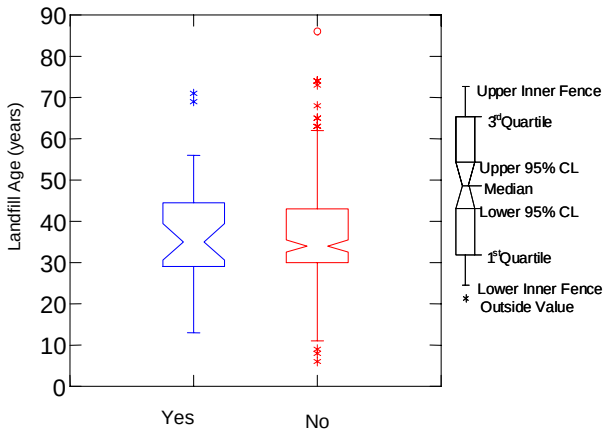
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Landfill Age	0.963

Log-Scale Frequency Diagram of Landfill Age By Gas Enforcement Action Category



Box-and-Whisker Plot of Age of Site by Gas Enforcement Action Category



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is no statistically significant difference in age between landfills that are in the category “Has Gas Enforcement Action” and those in the category “Does Not Have Gas Enforcement Action.”

Site Characteristic (Independent Variable)

Landfill Age (Construction Before/During 1984 or After 1984)

Value and Number of Landfills

Construction Before/During 1984: 209
Construction After 1984: 15

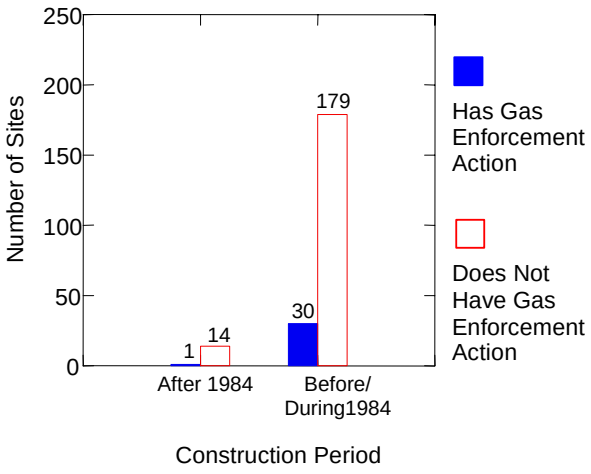
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

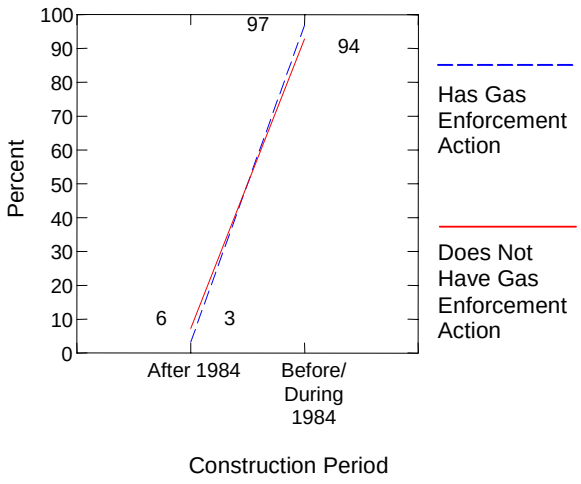
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Construction date after 1984	Construction date before/during 1984	0.4183	.4262	3.362	0.054

Number of Sites in Each Gas Enforcement Action Category by Construction Period



Percent of Sites in Each Gas Enforcement Action Category by Construction Period



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether a site was built before/during 1984 or after 1984 does not increase or decrease the likelihood that it is in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Landfill Age (20 Years or Less)

Value and Number of Landfills

Landfill age 20 years or less: 16
Landfill age greater than 20 years: 208

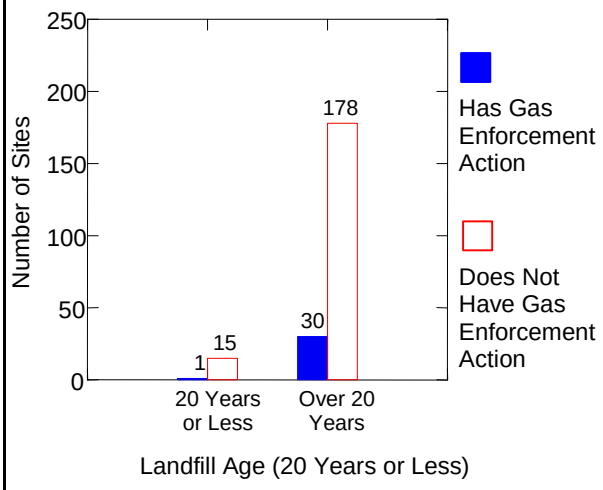
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

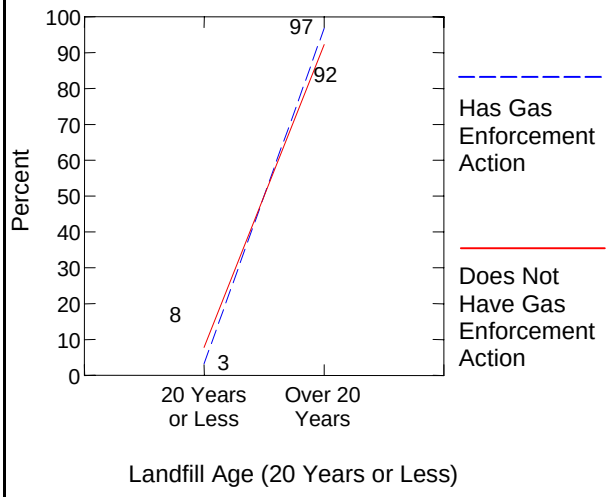
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Age of site 20 years or less	Age of site greater than 20 years	0.3778	0.3956	3.106	0.0503

Number of Sites in Each Gas Enforcement Action Category by Landfill Age (20 Years or Less)



Percent of Sites in Each Gas Enforcement Action Category by Landfill Age (20 Years or Less)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether or not a site is in the age bracket of 20 years or less does not increase or decrease the likelihood of its being in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Landfill Age (21–40 Years)

Value and Number of Landfills

Landfill age 21–40 years: 143
Other: 81

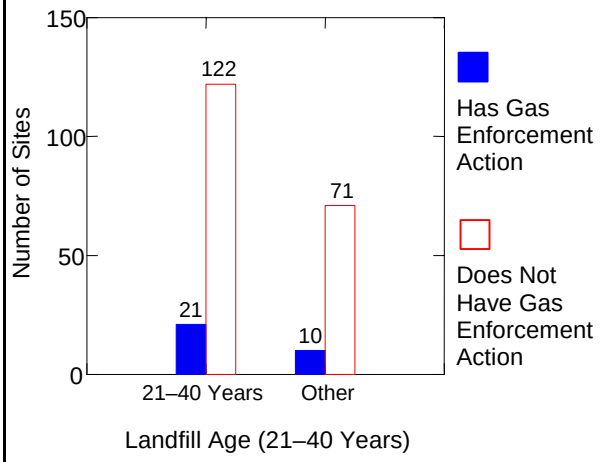
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

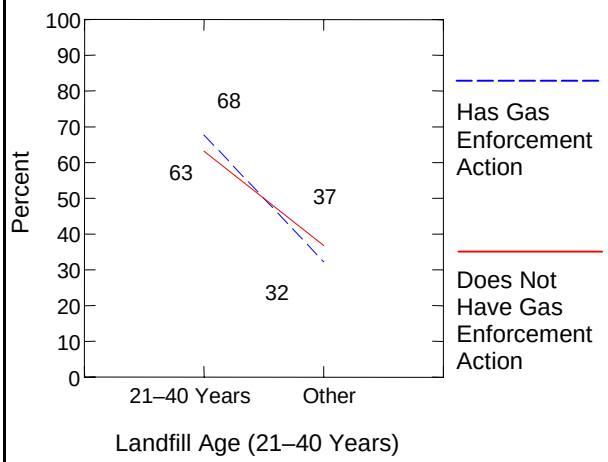
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill Age 21–40 Years	Other	0.6265	1.222	2.741	0.545

Number of Sites in Each Gas Enforcement Action Category by Landfill Age (21–40 Years)



Percent of Sites in Each Gas Enforcement Action Category by Landfill Age (21–40 Years)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether or not a site is between 21 and 40 years old does not increase or decrease the likelihood of its being in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Landfill Age (41–60 Years)

Value and Number of Landfills

Landfill Age 41–60 years: 50
Other: 174

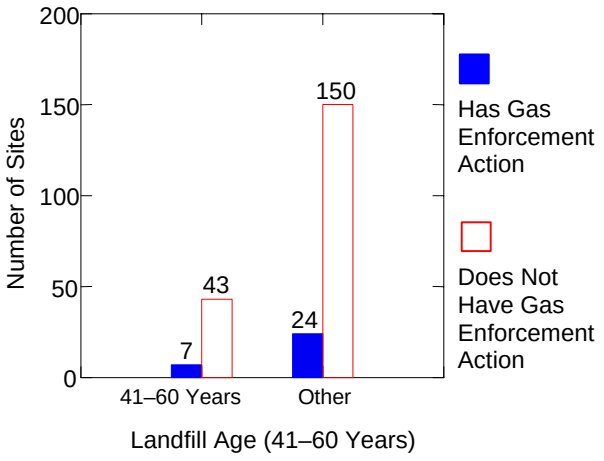
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

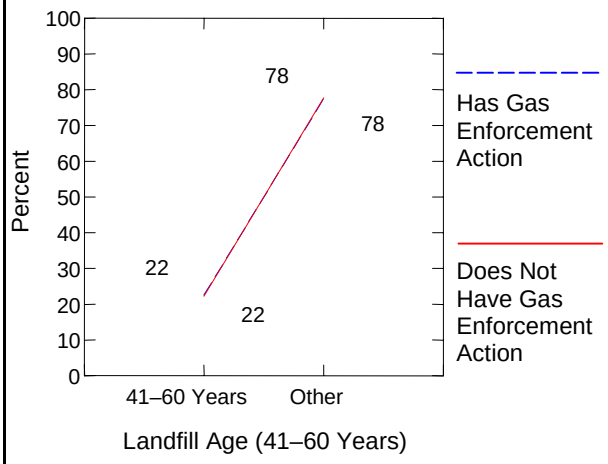
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill Age 41–60 years	Other	0.9702	1.017	2.522	0.411

Number of Sites in Each Gas Enforcement Action Category by Landfill Age (41–60 Years)



Percent of Sites in Each Gas Enforcement Action Category by Landfill Age (41–60 Years)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether or not a site is 41–60 years old does not increase or decrease the likelihood of its being in the category "Has Gas Enforcement Action."

Site Characteristic (Independent Variable)

Landfill Age (Greater Than 60 Years)

Value and Number of Landfills

Landfill Age Greater Than 60 Years: 15
Landfill Age 60 Years or Less: 209

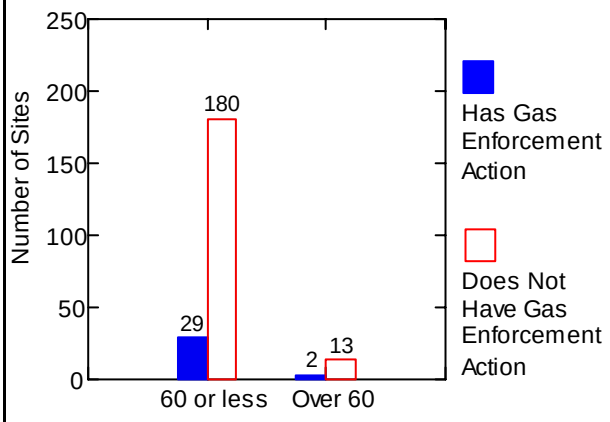
Environmental Performance

Dependent Variable: Has Gas Enforcement Action (Binary Values: Has Gas Enforcement Action or Does Not Have Gas Enforcement Action)

Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Enforcement Action")

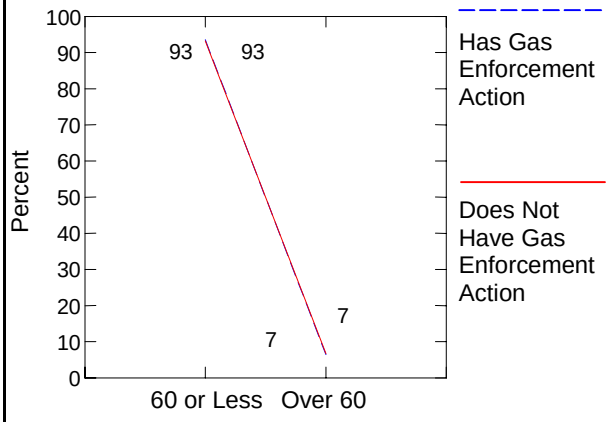
Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill Age Greater Than 60 Years	Landfill Age Less Than or Equal To 60 years	0.9532	0.9549	4.452	0.2048

Number of Sites in Each Gas Enforcement Action Category by Landfill Age (Greater Than 60 Years)



Landfill Age (Greater Than 60 Years)

Percent of Sites in Each Gas Enforcement Action Category by Landfill Age (Greater Than 60 Years)



Landfill Age (Greater Than 60 Years)

Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether or not a site is over 60 years old does not increase or decrease the likelihood that of its being in the category "Has Gas Enforcement Action."

Appendix B-3

Assessment of Individual MSW Landfill Site Characteristics by Gas Inspection Report Status

Results statements in this appendix are based on the study's Task 2 database inventory, which contains data on the 224 MSW landfills studied.

Site Characteristic (Independent Variable)

Owner Type

Value and Number of Landfills

Public: 168
Private: 56

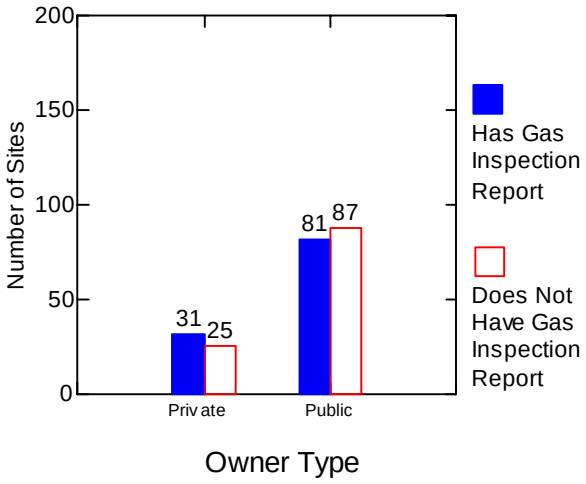
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

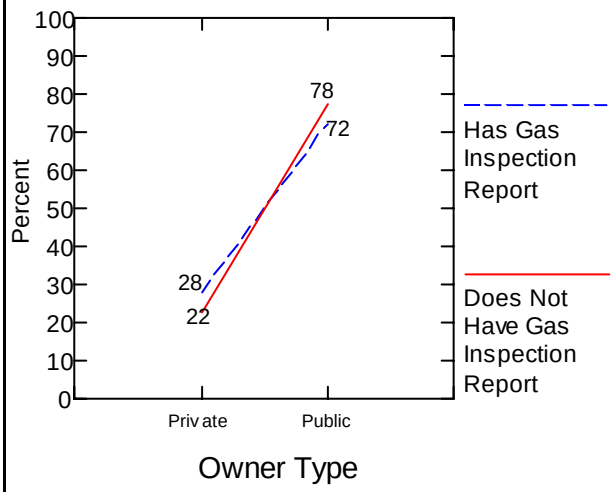
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Private	Public	0.355	1.33	2.445	0.725

Number of Sites in Each Gas Inspection Report Category by Owner Type



Percent of Sites in Each Gas Inspection Report Category by Owner Type



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Owner type does not increase or decrease the likelihood of a site's being in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)

Physical Setting

Value and Number of Landfills

Inland: 119	Alpine: 13
Desert: 58	High Desert: 9
Coastal: 17	Estuarine: 8

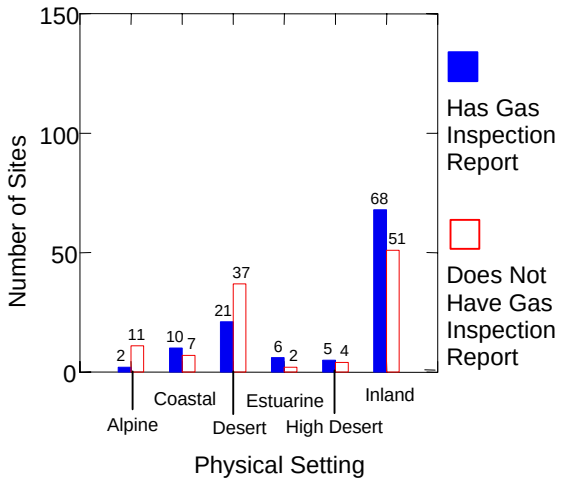
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

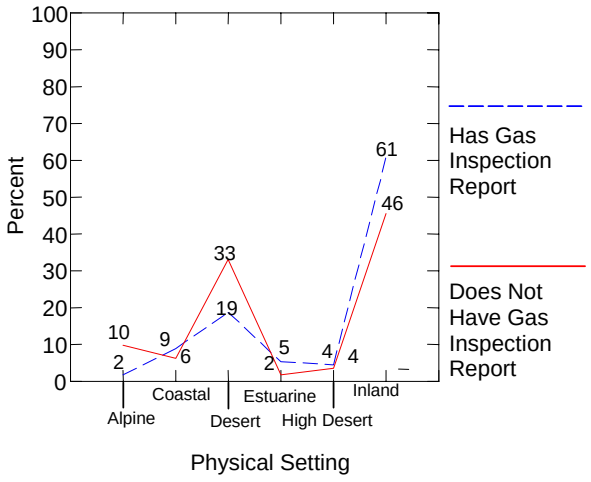
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Has Gas Inspection Report")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
High Desert	Inland	0.926	1.067	4.173	0.273
Desert	**Inland**	**0.010**	**2.349**	**4.486**	**1.230**
Alpine	**Inland**	**0.012**	**7.334**	**34.542**	**1.557**
Coastal	Inland	0.896	0.933	2.619	0.333
Estuarine	Inland	0.333	0.444	2.293	0.086

Number of Sites in Each Gas Inspection Report Category by Physical Setting



Percent of Sites in Each Gas Inspection Report Category by Physical Setting



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

It is approximately 2.3 times less likely that a desert site is in the category "Has Gas Inspection Report" than an inland site. It is approximately 7.3 times less likely that an alpine site is in the category "Has Gas Inspection Report" than an inland site. No other physical settings increase or decrease the likelihood that a site is in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)

Social Setting

Value and Number of Landfills

Rural: 139
Urban: 71
Suburban: 14

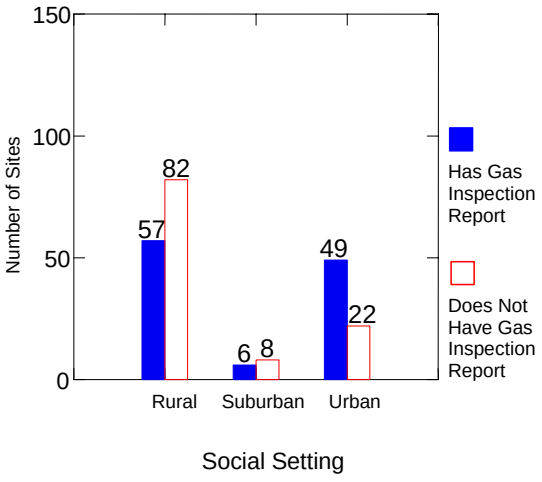
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

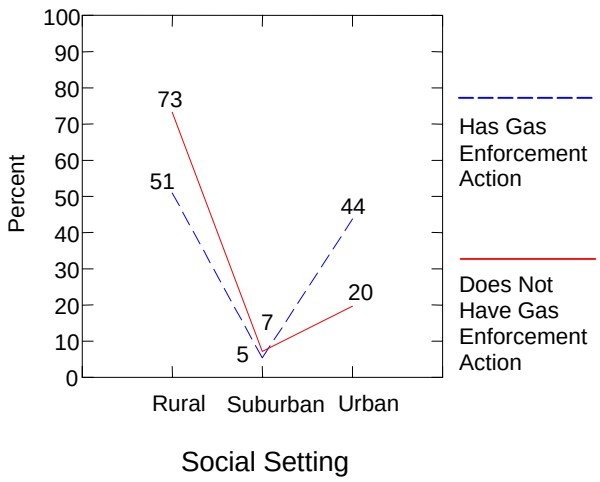
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Urban	Rural	0.00017	3.20415	5.87354	1.74793
Suburban	Rural	0.89338	1.07895	3.2777	0.35517

Number of Sites in Each Gas Inspection Report Category by Social Setting



Percent of Sites in Each Gas Inspection Report Category by Social Setting



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

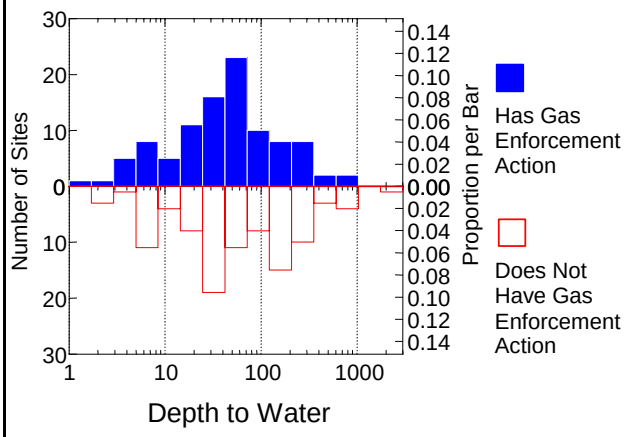
It is approximately 3.2 times more likely that an urban site is in the category "Has Gas Inspection Report" than a rural site. The suburban setting does not increase or decrease the likelihood that a site is in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)	**Minimum Depth to Underlying Groundwater** **Value and Number of Landfills** Continuous
Environmental Performance	**Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")**

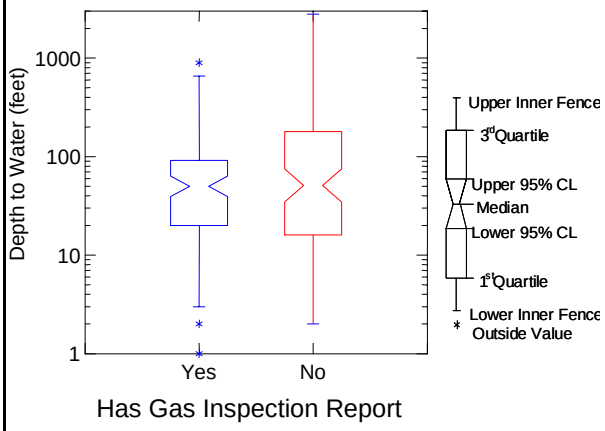
Summary Table of Results
Kruskal-Wallis Analysis of Variance

Independent Variable Category	Probability
Minimum Depth to Underlying Groundwater	0.573

Log-Scale Frequency Diagram of Depth to Water by Gas Inspection Report Category



Box-and-Whisker Plot of Depth to Water by Gas Inspection Report Category



Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	There is not a statistically significant difference in depth to water whether a site is in the category "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report."

Site Characteristic (Independent Variable)

Underlying Geologic Material

Value and Number of Landfills

Sand and/or Gravel: 95
Silts/Clays: 62
Sedimentary Rock: 51
Igneous Rock: 16

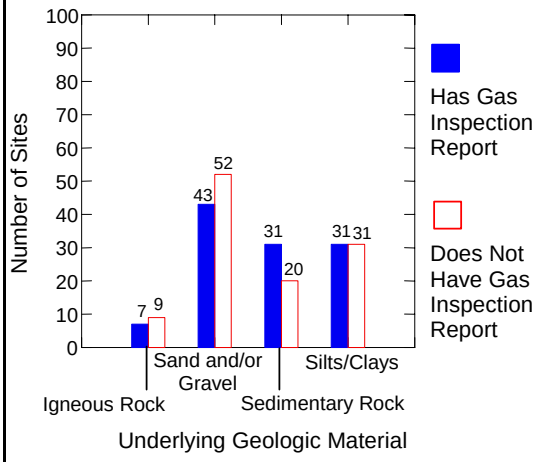
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

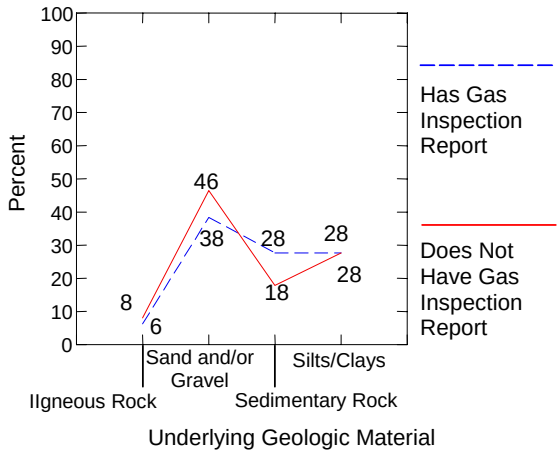
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Igneous Rock	Sand and/or Gravel	0.910	0.941	2.734	0.324
Sedimentary Rock	Sand and/or Gravel	0.075	1.874	3.745	0.938
Silts/Clays	Sand and/or Gravel	0.561	1.209	2.296	0.637

Number of Sites in Each Gas Inspection Report Category by Underlying Geologic Material



Percent of Sites in Each Gas Inspection Report Category by Underlying Geologic Material



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

At a 95 percent significance level, the underlying geologic material does not increase or decrease the likelihood that a site is in the category "Has Gas Inspection Report." Under a lower significance level, such as 90 percent, results indicate it is approximately 1.9 times more likely that a sedimentary rock site is in the category "Has Gas Inspection Report" than a sand and/or gravel site.

Site Characteristic (Independent Variable)

Average Annual Precipitation

Value and Number of Landfills

Continuous

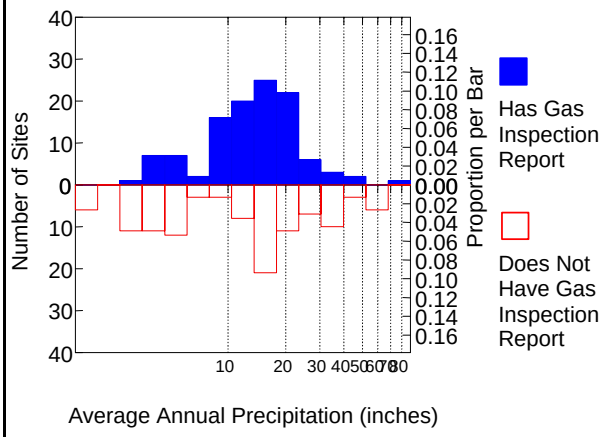
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

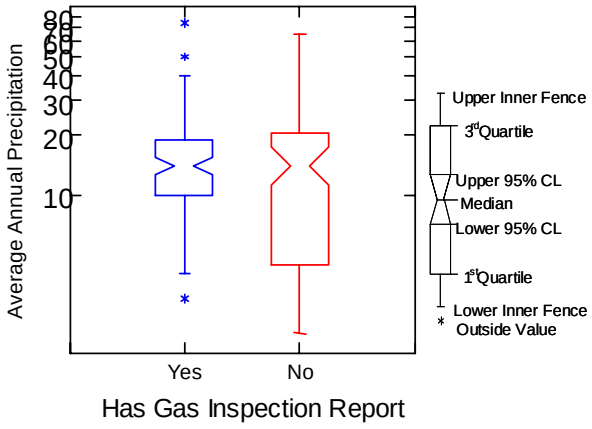
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Annual Precipitation	0. 239

Log-Scale Frequency Diagram of Average Annual Precipitation by Gas Inspection Report Category



Box-and-Whisker Plot of Average Annual Precipitation by Gas Inspection Report Category



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is no statistically significant difference in average annual precipitation, whether a site is in the category "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report."

Site Characteristic (Independent Variable)

Landfill Gas Collection System

Value and Number of Landfills

Yes: 103

No: 121

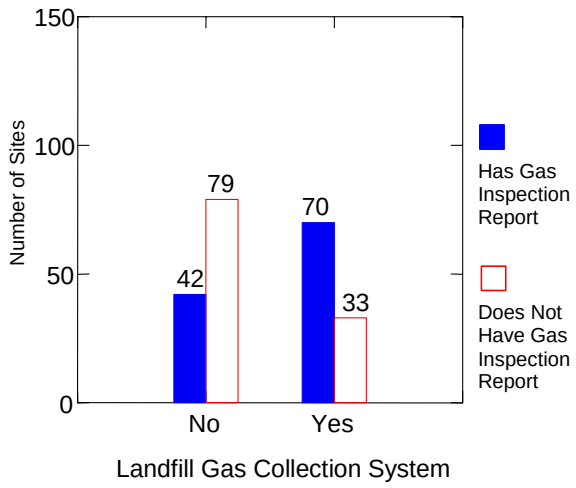
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

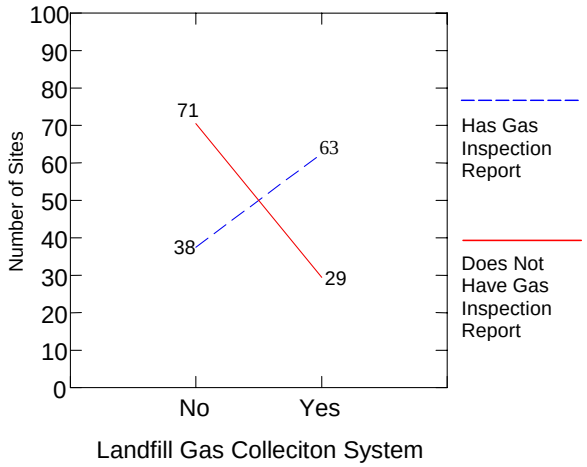
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Yes (has landfill gas monitoring)	No (does not have landfill gas monitoring)	0.0025	3.128	5.756	1.700

Number of Sites in Each Gas Inspection Report Category by Landfill Gas Collection System



Percent of Sites in Each Gas Inspection Report Category by Landfill Gas Collection System



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

It is approximately 3.1 times more likely that sites with landfill gas collection systems are in the category "Has Gas Inspection Report" than those that do not have landfill gas collection systems.

Site Characteristic (Independent Variable)

Landfill Size (Permitted Disposal Area)

Value and Number of Landfills

Continuous

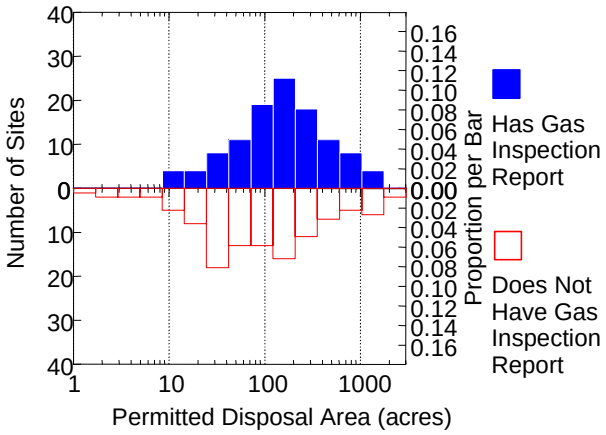
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

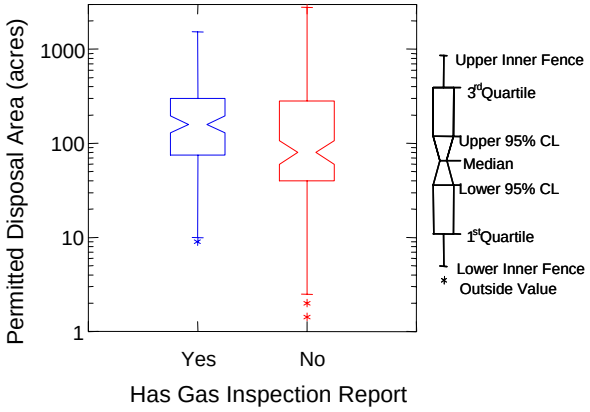
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Permitted Disposal Area	0.01049

Log-Scale Frequency Diagram of Permitted Disposal Area by Gas Inspection Report Category



Box-and-Whisker Plot of Permitted Disposal Area by Gas Inspection Report Category



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

The permitted disposal area is statistically different (in this case, greater) for those sites in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)

Liner Type (Whole Site)

Value and Number of Landfills

Completely Subtitle D* or Subtitle D Alternative: 4
Fully Lined, Partially Non-Subtitle D or Non-Subtitle D Alternative: 12
Partially Unlined: 70
Fully Unlined: 138

*Also referred to as "Sub-D."

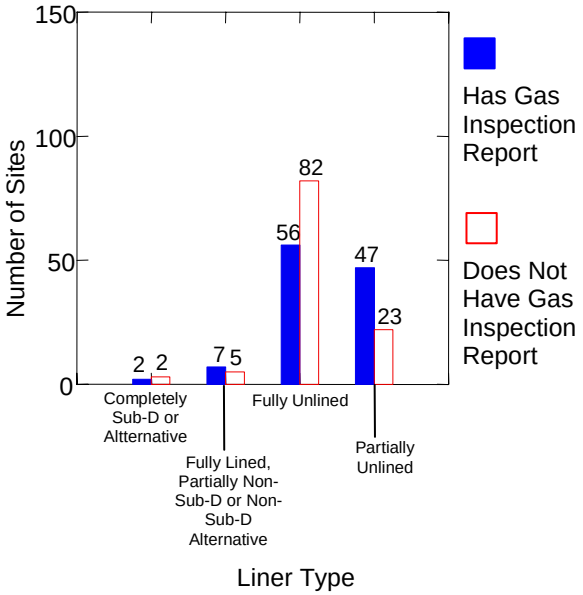
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

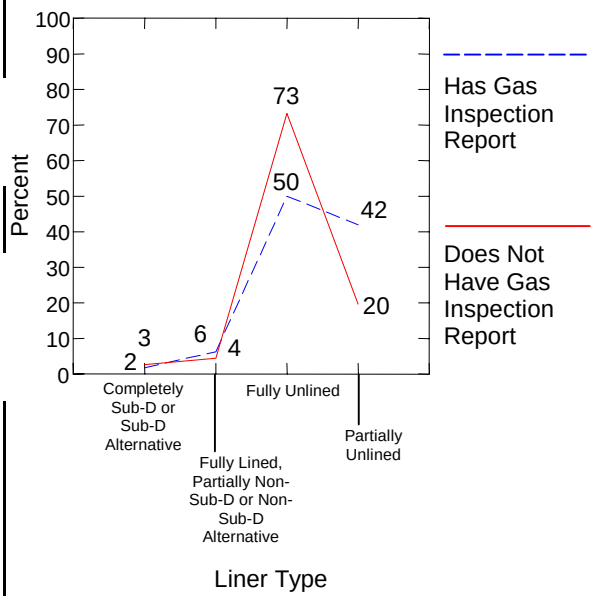
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Sub-D or Sub-D Alternative	Fully Unlined	0.979	0.976	6.032	0.158
Fully Lined, Partially Non-Sub-D or Non-Sub-D-Alternative	Fully Unlined	0.240	2.05	6.785	0.619
Partially Unlined	**Fully Unlined**	**0.00025**	**3.128**	**5.756**	**1.700**

Number of Sites in Each Gas Inspection Report Category by Liner Type



Percent of Sites in Each Gas Inspection Report Category by Liner Type



Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	A partially unlined site is approximately 3.1 times more likely to be in the category “Has Gas Inspection Report” than a fully unlined site. No other liner category increases or decreases the likelihood that a site is in the category “Has Gas Inspection Report” relative to fully unlined sites.

Site Characteristic (Independent Variable)

Cover Type (Whole Site)

Value and Number of Landfills

Completely Covered: 48
Partially Uncovered: 30
Completely Uncovered: 146

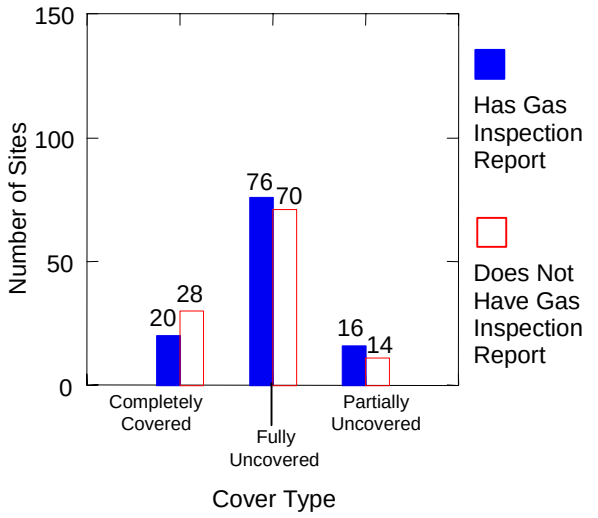
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

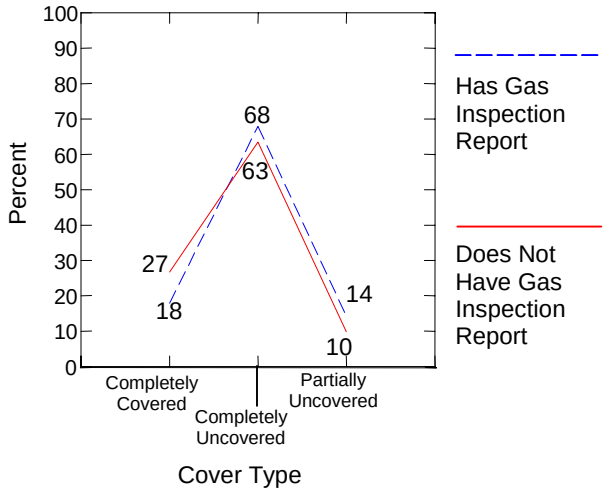
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Covered	Fully Uncovered	0.154	0.623	1.195	0.325
Partially Uncovered	Fully Uncovered	0.471	1.359	3.126	0.591

Number of Sites in Each Gas Inspection Report Category by Cover Type



Line Plot of Percent of Sites in Each Gas Inspection Report Category by Cover Type



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

The cover type does not increase or decrease the likelihood that a site is in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)

Landfill Age

Value and Number of Landfills

Continuous

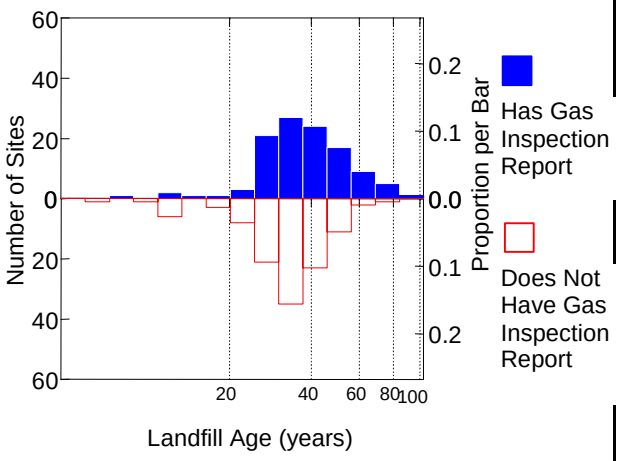
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

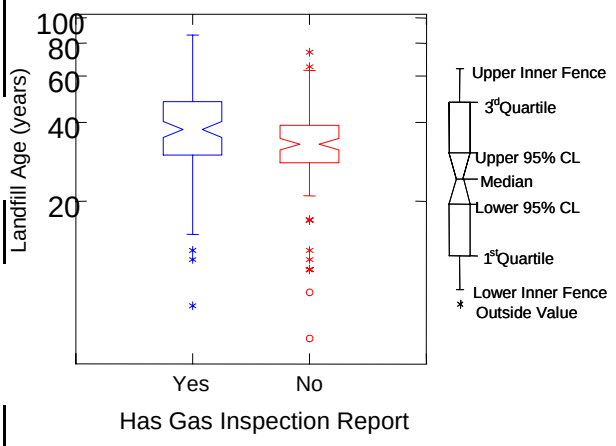
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Landfill Age	0.0007

Number of Sites in Each Gas Inspection Report Category by Construction Period



Line Plot of Percent of Sites In Each Gas Inspection Report Category by Construction Period



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

Landfill age is statistically different (in this case, greater) for those sites in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)

Landfill Age (Construction Before/During 1984 or After 1984)

Value and Number of Landfills

Construction before/during 1984: 209
Construction after 1984: 15

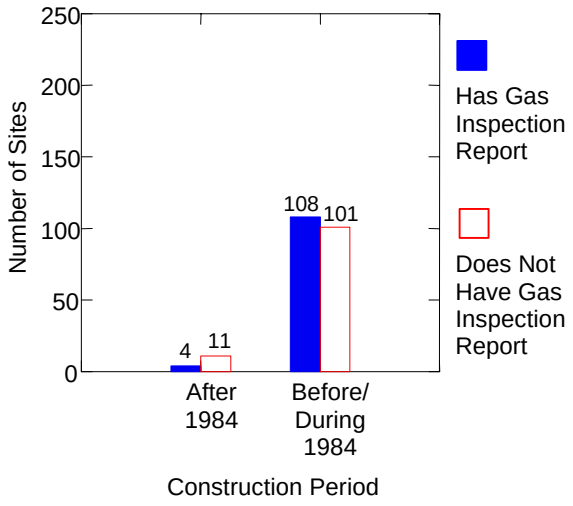
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

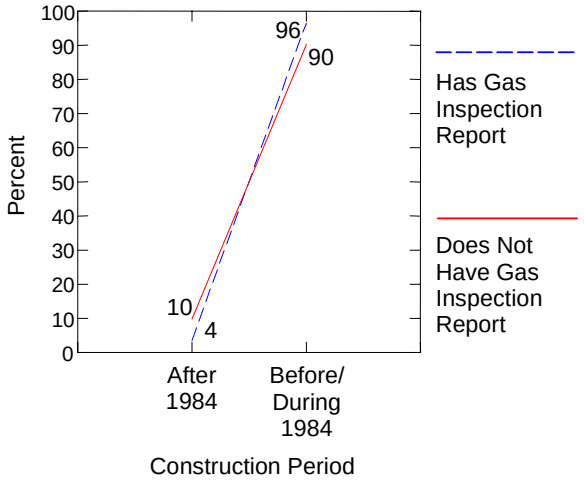
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Has Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Construction after 1984	Construction before/during 1984	0.072	2.941	9.533	0.907

Number of Sites in Each Gas Inspection Report Category by Construction Period



Line Plot of Percent of Sites In Each Gas Inspection Report Category by Construction Period



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

At a 95 percent significance level, whether a site was built before/during 1984 or after 1984 does not increase or decrease the likelihood of its being in the category "Has Gas Inspection Report." Under a 90 percent significance level, results indicate it is approximately 2.9 times less likely that a site constructed after 1984 is in the category "Has Gas Inspection Report" than a site built before or during 1984.

Site Characteristic (Independent Variable)

Landfill Age (20 Years or Less)

Value and Number of Landfills

Age of site less than or equal to 20 years: 16
Age of site greater than 20 years: 208

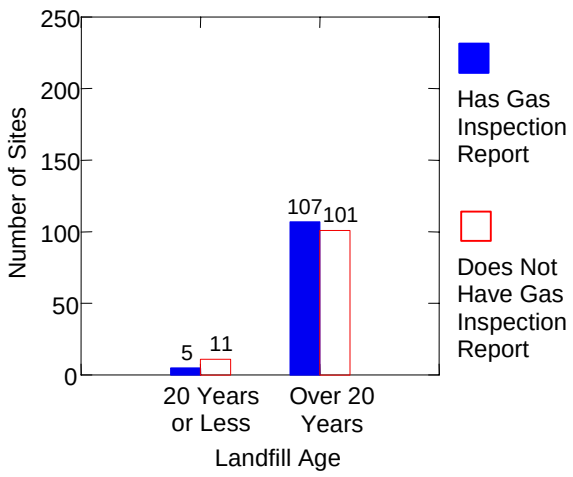
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

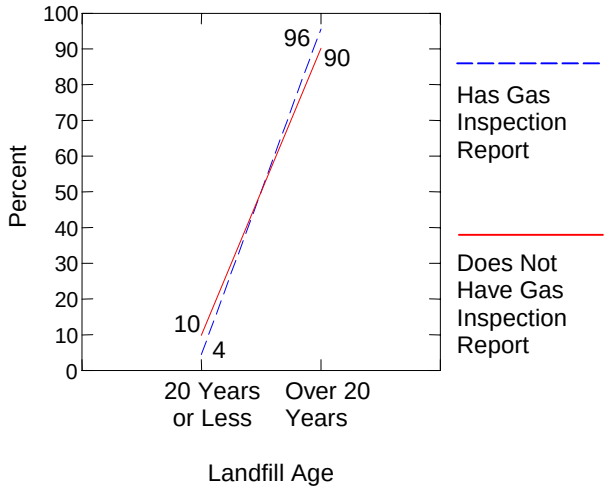
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill age 20 years or less	Age of site greater than 20 years	0.1287	0.429	1.278	0.144

Number of Sites in Each Gas Inspection Report Category by Landfill Age (20 Years or Less)



Percent of Sites in Each Gas Inspection Report Category by Landfill Age (20 Years or Less)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether or not a site is 20 years old or less does not increase or decrease the likelihood that it is in the category "Has Gas Inspection Report."

Site Characteristic (Independent Variable)

Landfill Age (21–40 Years)

Value and Number of Landfills

Age of site 21–40 years: 143
Other: 81

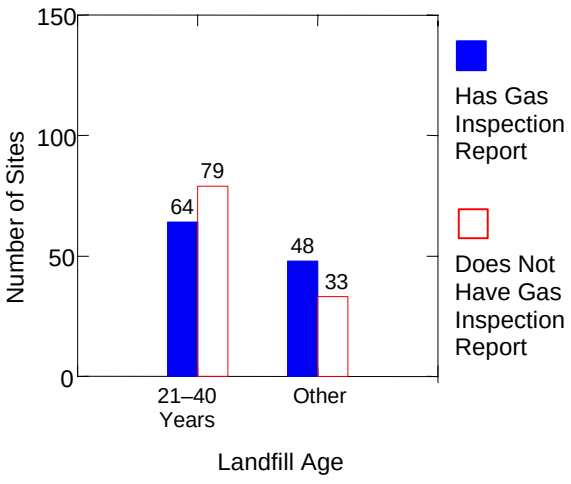
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

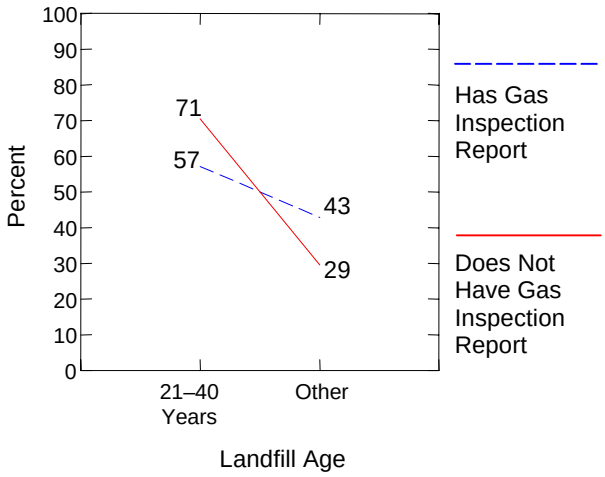
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill age 21–40 years	Other	0.0378	1.795	3.119	1.033

Number of Sites in Each Gas Inspection Report Category by Landfill Age (21–40 Years)



Percent of Sites Within Each Gas Inspection Report Category by Landfill Age (21–40 Years)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

A site between 21 and 40 years old is approximately 1.8 times less likely to be in the category "Has Gas Inspection Report" than are other sites.

Site Characteristic (Independent Variable)

Landfill Age (41–60 Years)

Value and Number of Landfills

Age of site 41–60 years: 50
Other: 174

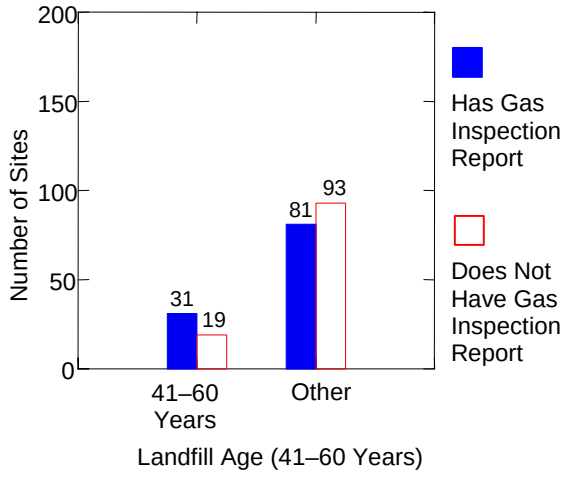
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

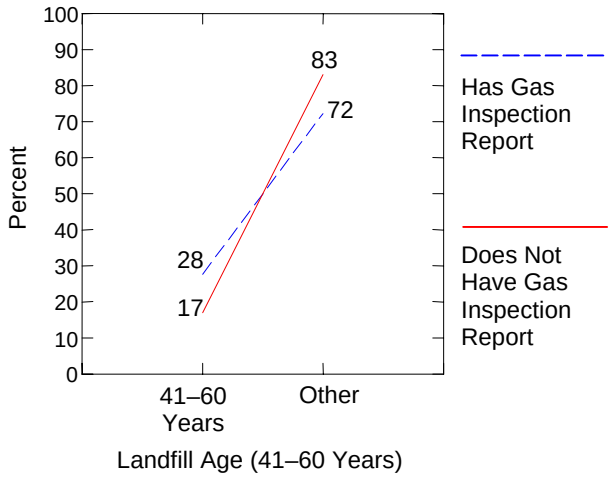
Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill age 41–60 years	Other	0.0561	1.873	3.567	0.984

Number of Sites in Each Gas Inspection Report Category by Landfill Age



(41–60 Years)

Percent of Sites Within Each Gas Inspection Report Category by Landfill Age



(41–60 Years)

Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

At a 95 percent significance level, whether a site is between 41 and 60 years old does not increase or decrease the likelihood of its being in the category "Has Gas Inspection Report." Under a 90 percent significance level, results indicate that a site between 41 and 60 years old is approximately 1.9 times more likely to be in the category "Has Gas Inspection Report" than other sites.

Site Characteristic (Independent Variable)

Landfill Age (Greater Than 60 Years)

Value and Number of Landfills

Age of site greater than 60 years: 15
Age of site less than or equal to 60 years: 209

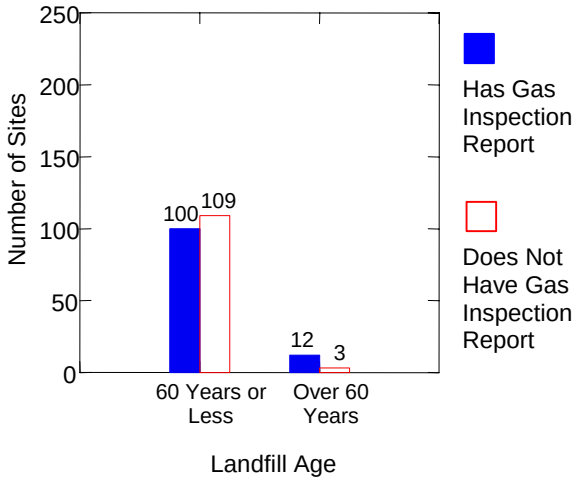
Environmental Performance

Dependent Variable: Has Gas Inspection Report (Binary Values: "Has Gas Inspection Report" or "Does Not Have Gas Inspection Report")

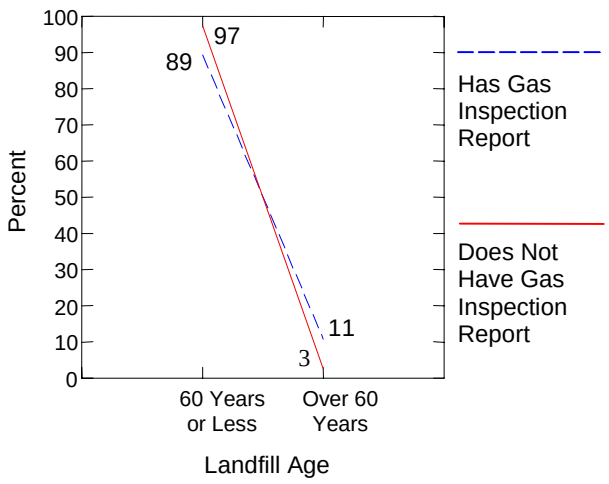
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Does Not Have Gas Inspection Report")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Landfill age greater than 60 years	Age of site less than or equal to 60 years	0.026	4.360	15.901	1.195

Number of Sites in Each Gas Inspection Report Category by Landfill Age (Greater Than 60 Years)



Percent of Sites Within Each Gas Inspection Report Category by Landfill Age (Greater Than 60 years)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

A site that is over 60 years old is approximately 4.36 times more likely to be in the category "Has Gas Inspection Report" than other sites.

Appendix B-4

Assessment of Individual MSW Landfill Site Characteristics By Corrective Action Status

Results statements in this appendix are based on the study's Task 2 database inventory, which contains data on the 224 MSW landfills studied.

Site Characteristic (Independent Variable)

Owner Type

Value and Number of Landfills

Public: 168
Private: 56

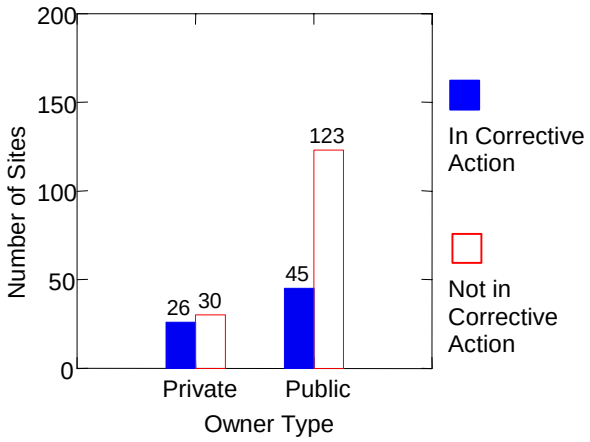
Environmental Performance

Dependent Variable: "In Corrective Action" (Binary Values: "In Corrective Action" or "Not in Corrective Action").

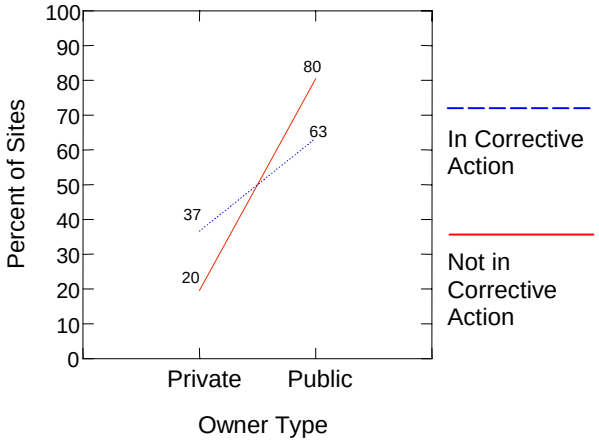
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Private	Public	0.007	2.369	4.432	1.266

Number of Sites in Each Corrective Action Category by Owner Type



Percent of Sites in Each Corrective Action Category by Owner Type



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Private sites are 2.37 times more likely to be in the category "In Corrective Action" than are public sites.

Site Characteristic (Independent Variable)

Physical Setting

Value and Number of Landfills

Inland: 119
Desert: 58
Coastal: 17
Alpine: 13
High Desert: 9
Estuarine: 8

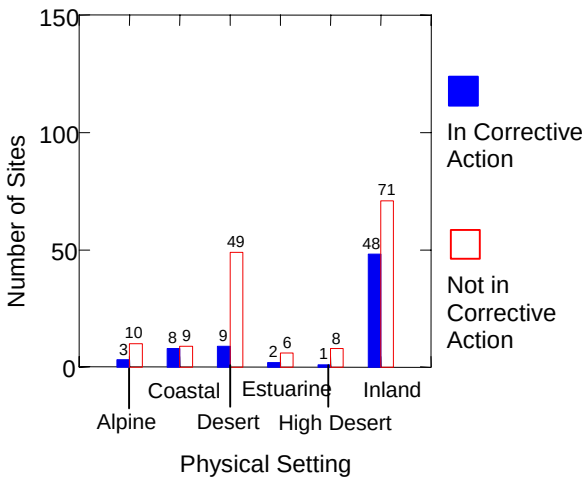
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

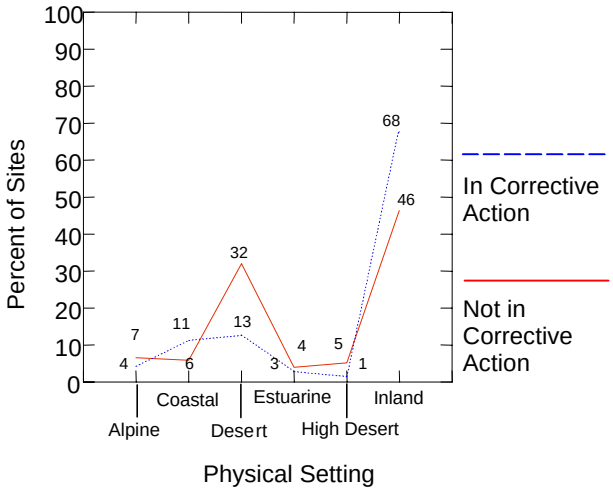
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "In Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
High Desert	Inland	0.117	5.408	44.649	0.655
Desert	**Inland**	**0.001**	**3.681**	**8.188**	**1.655**
Alpine	Inland	0.235	2.254	8.616	0.589
Coastal	Inland	0.599	0.761	2.11	0.274
Estuarine	Inland	0.399	2.028	10.473	0.393

Number of Sites in Each Corrective Action Category by Physical Setting



Percent of Sites in Each Corrective Action Category by Physical Setting



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Desert sites are 3.68 times less likely to be in the category "In Corrective Action" than inland sites. No other physical settings increase or decrease the likelihood of a site's being in the category "In Corrective Action".

Site Characteristic (Independent Variable)

Social Setting

Value and Number of Landfills

Rural: 139
Urban: 71
Suburban: 14

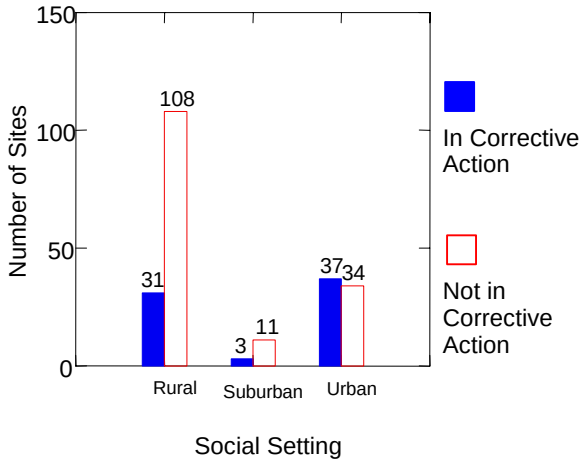
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

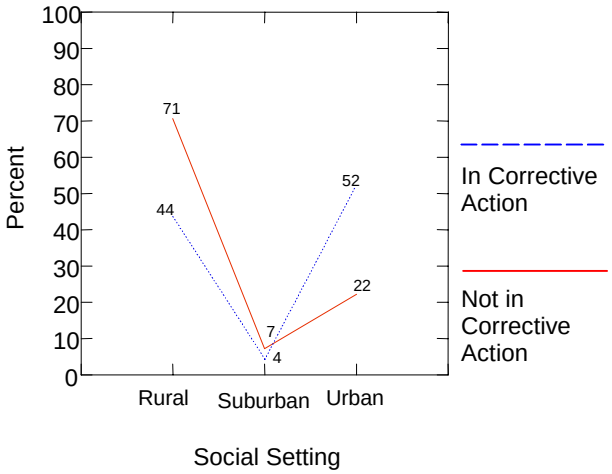
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Urban	Inland	0.00002	3.791	7.002	2.053
Suburban	Inland	0.940	0.950	3.620	0.250

Number of Sites in Each Corrective Action Category by Social Setting



Percent of Sites in Each Corrective Action Category by Social Setting



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Urban sites are 3.97 times more likely to be in the category "In Corrective Action" than rural sites. The suburban category does not increase or decrease the likelihood that a site is in the category "In Corrective Action."

Site Characteristic (Independent Variable)

Minimum Depth to Underlying Groundwater

Value and Number of Landfills

Continuous

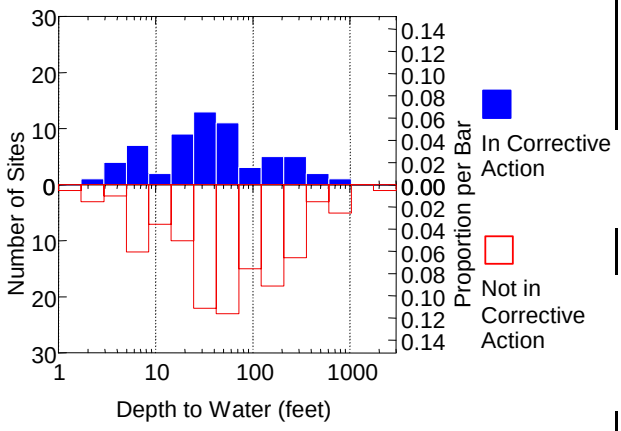
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

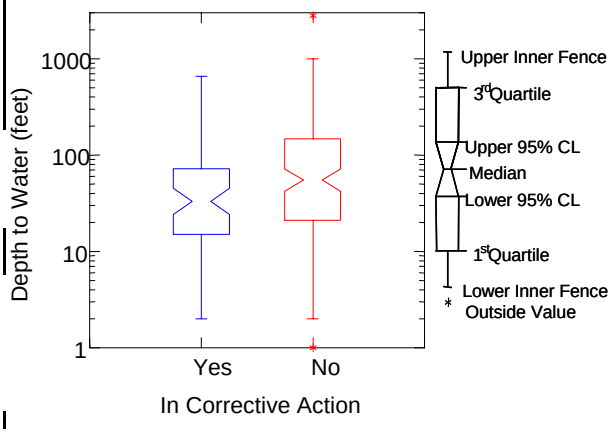
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Minimum Depth to Underlying Groundwater	0.136

Log-Scale Frequency Diagram of Depth to Water by Corrective Action Status



Box-and-Whisker Plot of Depth to Water by Corrective Action Status



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is no statistically significant difference in the depth to water between sites in the category "In Corrective Action" and those in the category "Not In Corrective Action."

Site Characteristic (Independent Variable)

Underlying Geologic Material

Value and Number of Landfills

Sand and/or Gravel: 95
Silts/Clays: 62
Sedimentary Rock: 51
Igneous Rock: 16

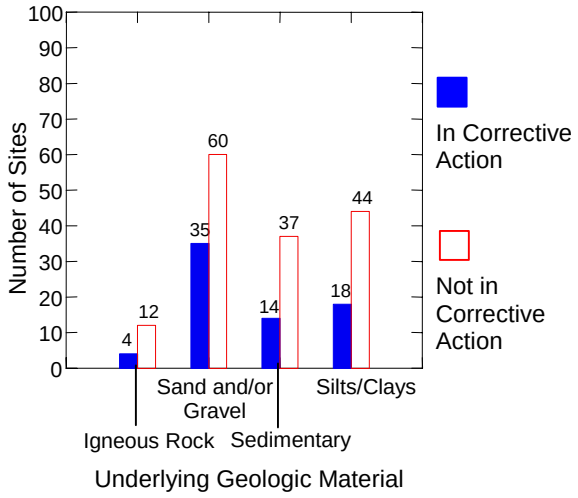
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

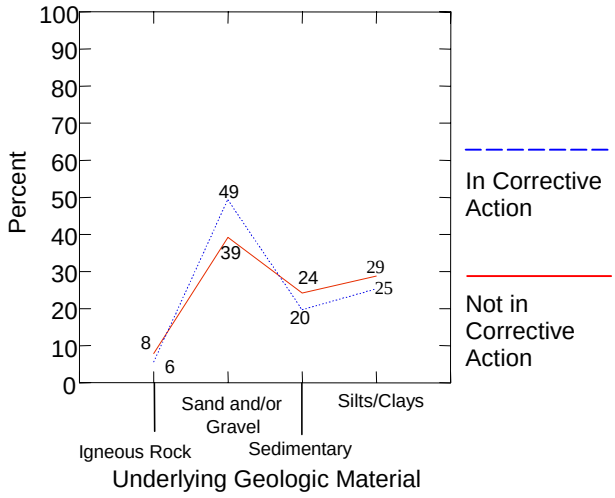
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "In Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Igneous Rock	Sand and/or Gravel	0.36307	0.57143	1.90849	0.17109
Sedimentary Rock	Sand and/or Gravel	0.25349	0.64865	1.36356	0.30856
Silts/Clays	Sand and/or Gravel	0.3127	0.7013	1.39657	0.35216

Number of Sites in Each Corrective Action Category by Underlying Geologic Material



Percent of Sites in Each Corrective Action Category by Underlying Geologic Material



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Underlying geologic material does not increase or decrease the likelihood that a site is in the category "In Corrective Action".

Site Characteristic (Independent Variable)

Average Annual Precipitation

Value and Number of Landfills

Continuous

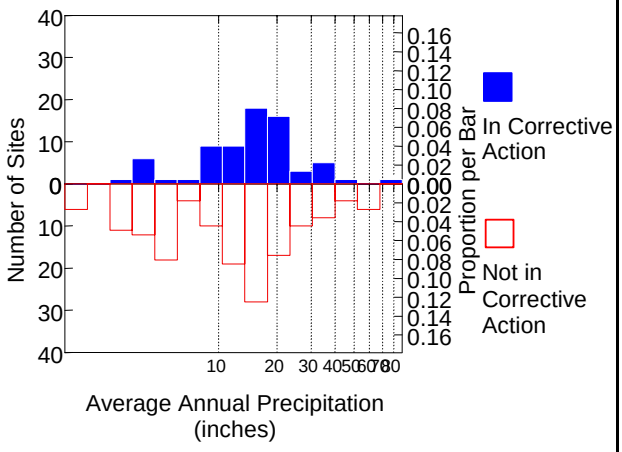
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

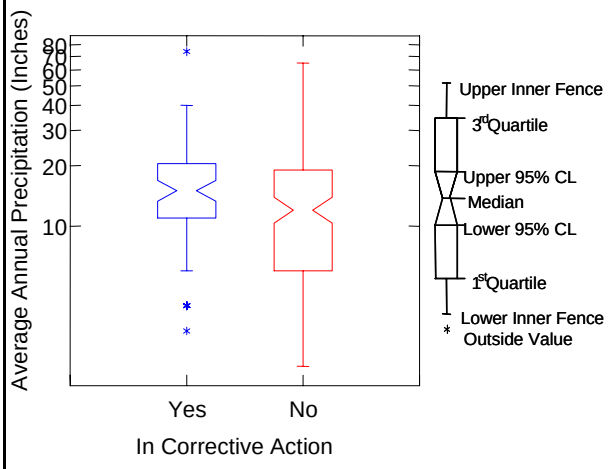
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Average Annual Precipitation	0.033

Log-Scale Frequency Diagram of Average Annual Precipitation by Corrective Action Status



Box-and-Whisker Plot of Average Annual Precipitation by Corrective Action Status



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

The average annual precipitation is statistically different (in this case greater) for sites in the category "In Corrective Action" than for sites in the category "Not In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Gas Collection System

Value and Number of Landfills

Yes: 103
No: 121

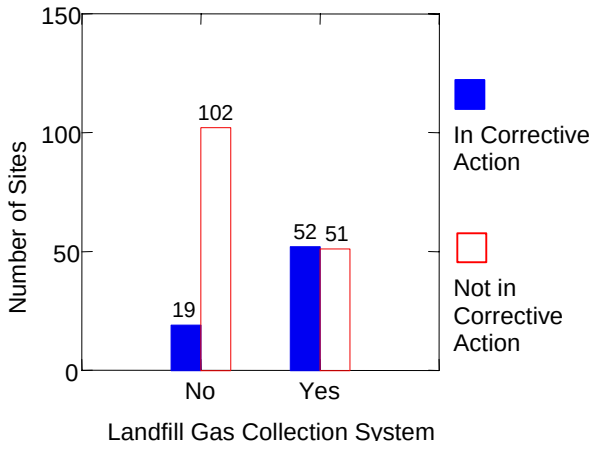
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

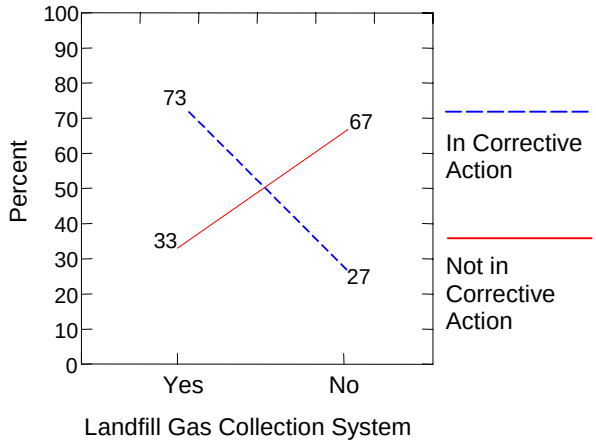
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Yes (have landfill gas monitoring)	No (do not have landfill gas monitoring)	0.0000	5.474	10.213	2.934

Number of Sites in Each Corrective Monitoring Category by Landfill Gas Collection System



Percent of Sites in Each Category by Landfill Gas Collection System



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

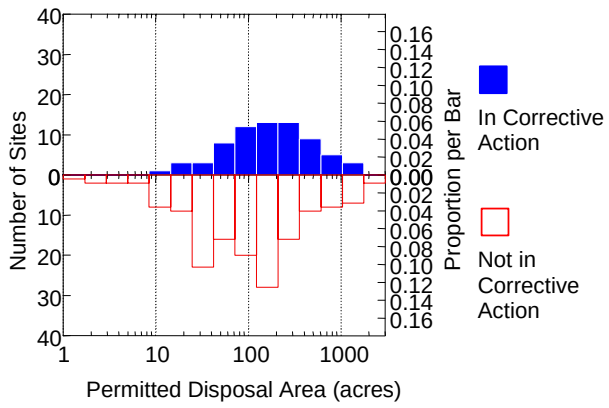
Sites that have landfill gas collection systems are 5.47 times more likely to be in the category "In Corrective Action" than those that do not have landfill gas collection systems.

Site Characteristic (Independent Variable)	**Landfill Size (Permitted Disposal Area)** **Value and Number of Landfills** Continuous
Environmental Performance	**Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")**

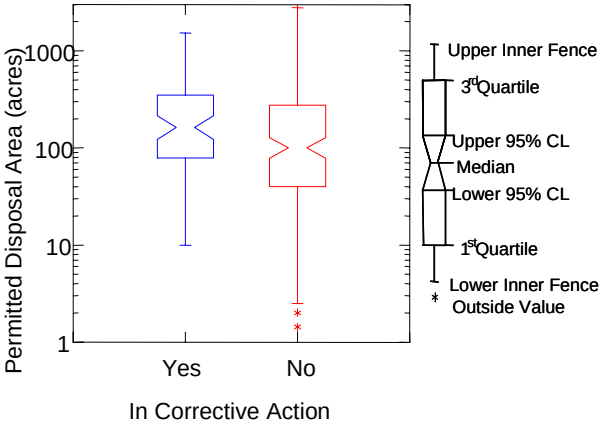
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Permitted Disposal Area	0.007

Log-Scale Frequency Diagram of Permitted Disposal Area by Corrective Action Status



Box-and-Whisker Plot of Permitted Disposal Area by Corrective Action Status



Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	The permitted landfill area is statistically different (in this case greater) for sites in the category "In Corrective Action" than for sites in the category "Not In Corrective Action."

Site Characteristic (Independent Variable)

Liner Type (Whole Site)

Value and Number of Landfills

Completely Subtitle* D or Subtitle D Alternative: 4
Fully Lined – Partially Non-Subtitle D or Non-Subtitle D Alternative: 12
Partially Unlined: 70
Fully Unlined: 138

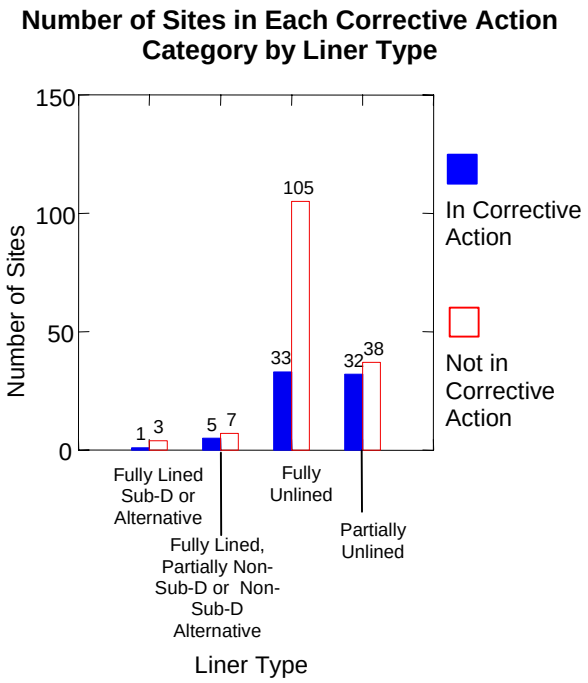
*Also referred to as "Sub-D."

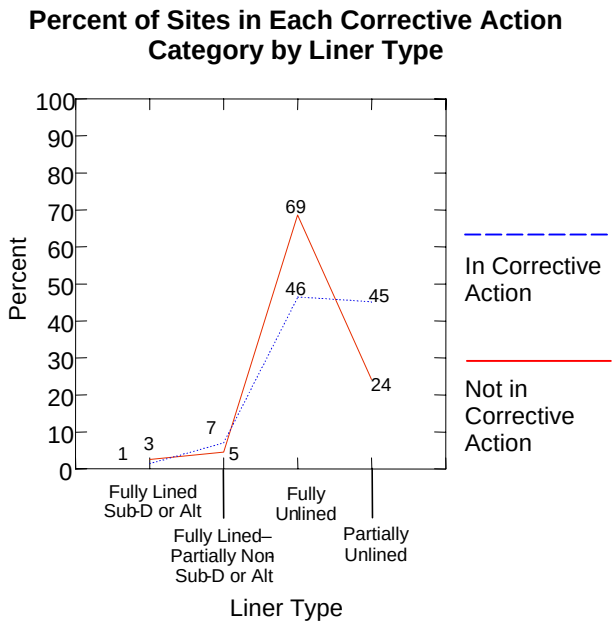
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Sub-D or Sub-D alternative	Fully Unlined	0.840	0.795	7.368	0.086
Fully lined – partially non-Sub-D or non-Sub-D alternative	Fully Unlined	0.184	2.273	7.640	0.676
Partially Unlined	**Fully Unlined**	**0.001**	**2.752**	**5.084**	**1.489**





Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	Partially unlined sites are 2.75 times more likely to be in the category “In Corrective Action” than fully unlined sites. No other liner category increases or decreases the likelihood that a site is in the category “In Corrective Action” relative to fully unlined sites.

Site Characteristic (Independent Variable)

Cover Type (Whole Site)

Value and Number of Landfills

Completely Covered: 48
Partially Uncovered: 30
Completely Uncovered: 146

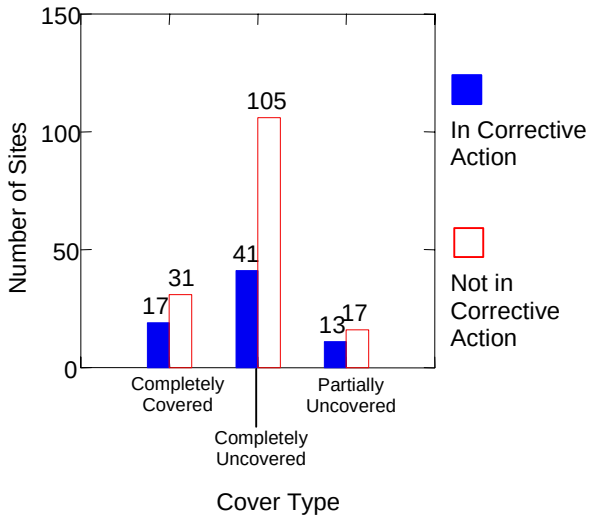
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

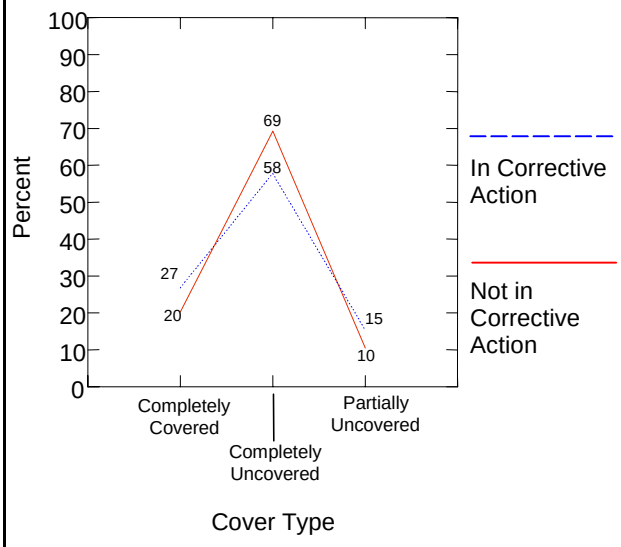
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Completely Covered	Fully Uncovered	0.182	1.585	3.11	0.807
Partially Uncovered	Fully Uncovered	0.184	1.777	4.151	0.761

Number of Sites in Each Corrective Action Category by Cover Type



Percent of Sites in Each Corrective Action Category by Cover Type



Variable Type for Statistical Analysis

Categorical Independent Variable

Results Statement

Cover type does not increase or decrease the likelihood that a site is in the category "In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Age

Value and Number of Landfills

Continuous

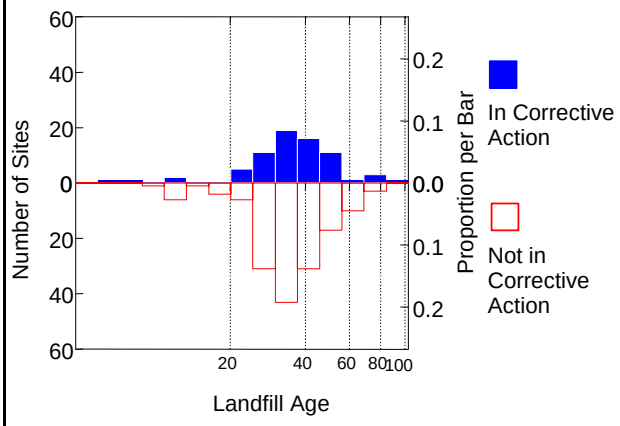
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

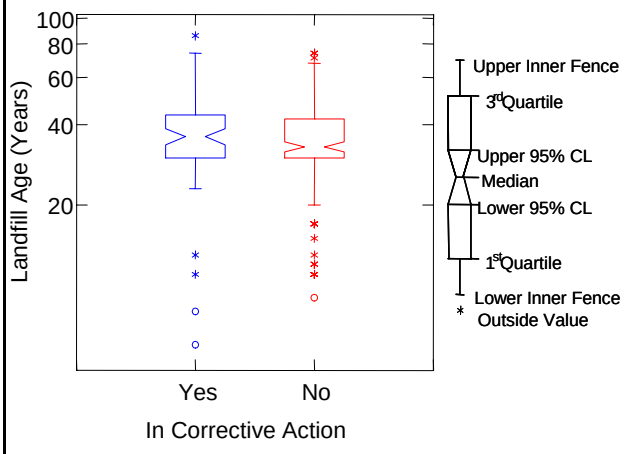
Summary Table of Results
(Kruskal-Wallis Analysis of Variance)

Independent Variable Category	Probability
Age of Site	0.253

Log-Scale Frequency Diagram of Landfill Age by Corrective Action Status



Box-and-Whisker Plot of Landfill Age by Monitoring Status



Variable Type for Statistical Analysis

Continuous Independent Variable

Results Statement

There is no statistically significant difference between the ages of sites in the category "In Corrective Action" and those in the category "Not In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Age (Construction Before/During 1984 or After 1984)

Value and Number of Landfills

Construction date before/during 1984: 209
Construction after 1984: 15

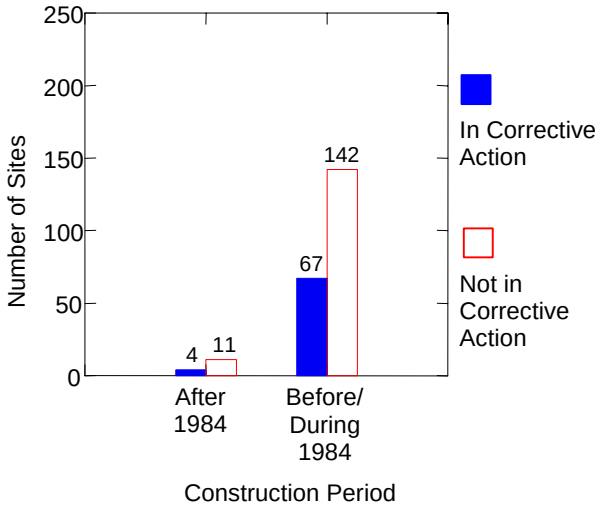
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

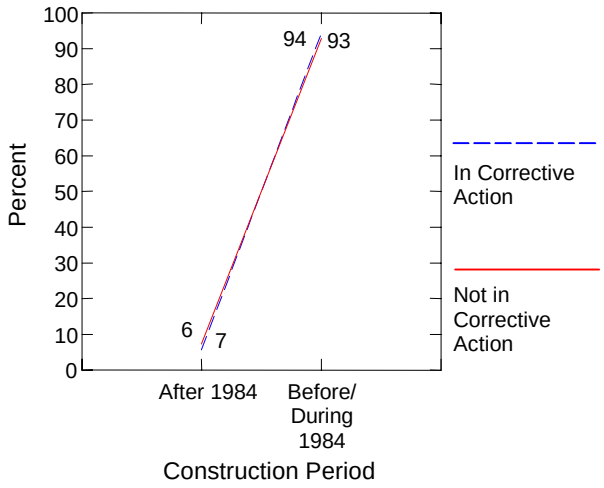
Summary Table of Results – Logistic Regression (Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Construction date after 1984	Construction date before/during 1984	0.666	0.771	2.510	0.237

Number of Sites in Each Corrective Action Category by Landfill Age (Construction Before/During or After 1984)



Percent of Sites Within Each Corrective Action Category by Landfill Age (Construction Before/During or After 1984)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether a site was built before/during 1984 or after 1984 does not increase or decrease the likelihood that it is in the category "In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Age (20 Years or Less)

Value and Number of Landfills

Age of site 20 years or less: 16
Age of site greater than 20 years: 208

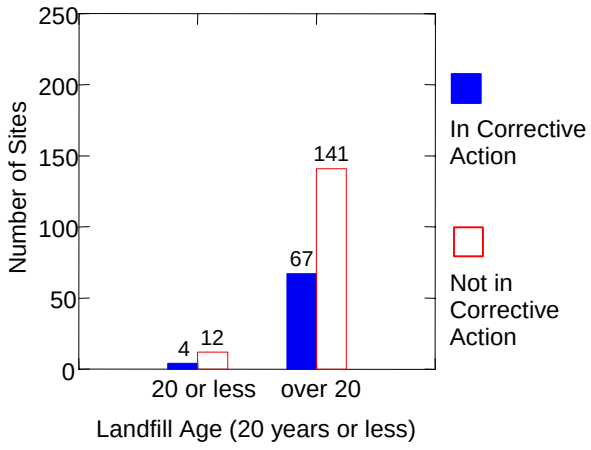
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

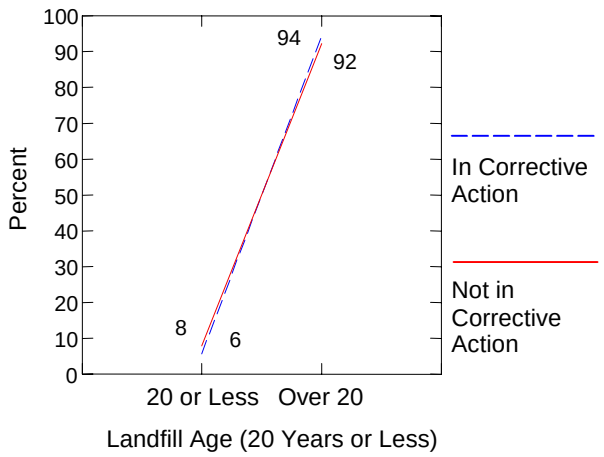
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Age of site 20 years or less	Age of site greater than 20 years	0.552	0.701	2.257	0.218

Number of Sites in Each Corrective Action Category by Landfill Age (20 Years or Less)



Percent of Sites in Each Corrective Action Category by Landfill Age (20 years or less)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether or not a site is 20 years old or less does not increase or decrease the likelihood of its being in the category "In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Age (21–40 Years)

Value and Number of Landfills

Age of site 21–40 years: 143
Other: 81

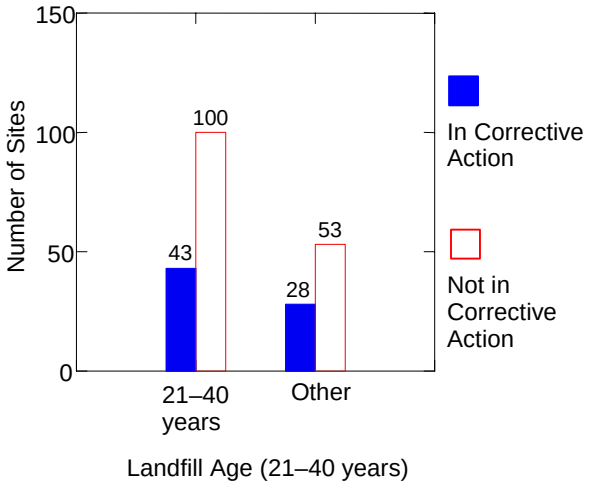
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

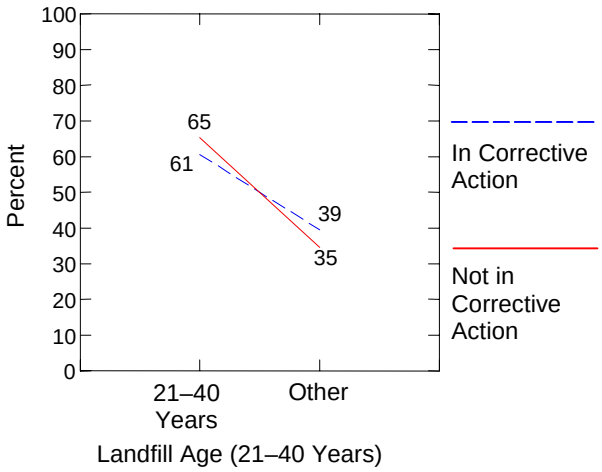
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Age of site 21–40 years	Other	0.4873	0.814	1.455	0.455

Number of Sites in Each Corrective Action Category by Landfill Age (21–40 Years)



Percent of Sites in Each Corrective Action Category by Landfill Age (21–40 Years)



Variable Type for Statistical Analysis: Dichotomous Independent Variable

Results Statement: Whether or not a site is 21–0 years old does not increase or decrease the likelihood of its being in the category "In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Age (41–60 Years)

Value and Number of Landfills

Age of site 41-60–years: 50
Other: 174

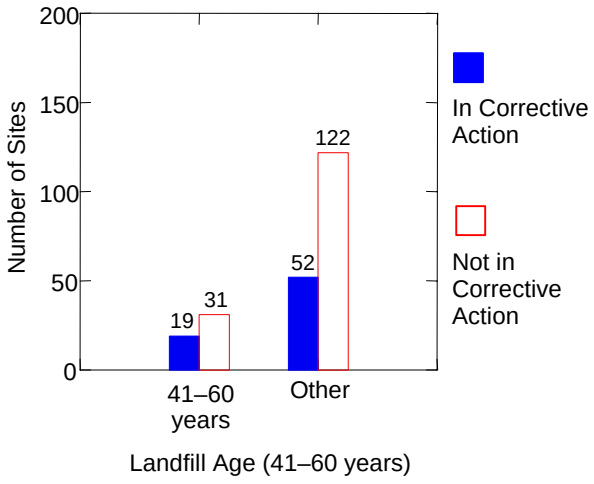
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

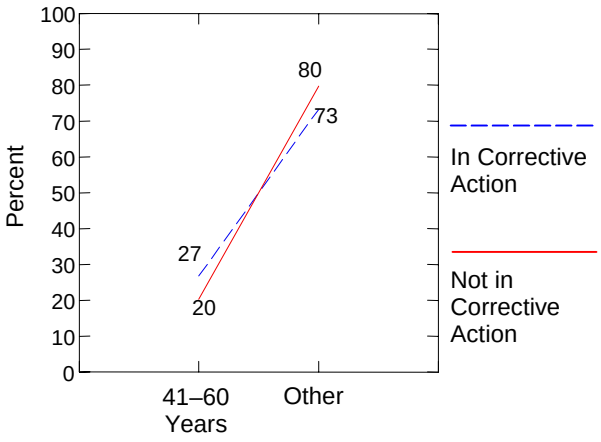
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds-Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Age of site 41–60 years	Other	0.278	1.438	2.773	0.746

Number of Sites in Each Corrective Action Category by Landfill Age (41–60 Years)



Percent of Sites in Each Monitoring Status Category Landfill Age (41–60 Years)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

Results Statement

Whether a site is between 41 and 60 years old does not increase or decrease the likelihood that it is "In Corrective Action."

Site Characteristic (Independent Variable)

Landfill Age (Greater Than 60 Years)

Value and Number of Landfills

Age of site greater than 60 years: 15
Age of site less than or equal to 60 years: 209

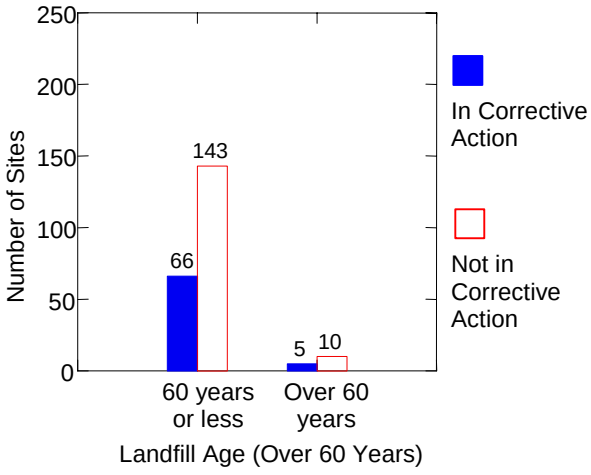
Environmental Performance

Dependent Variable: In Corrective Action (Binary Values: "In Corrective Action" or "Not in Corrective Action")

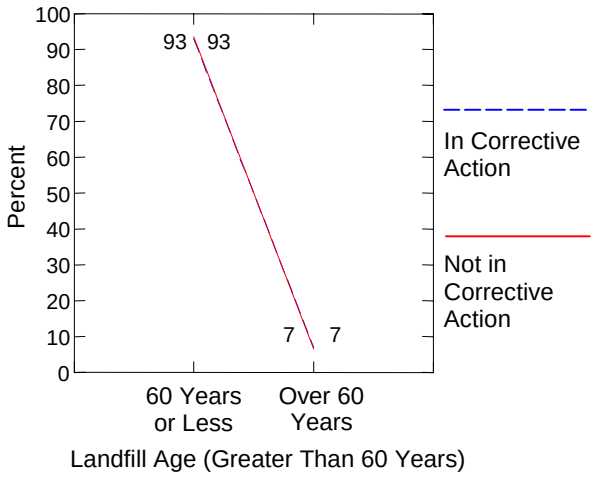
Summary Table of Results – Logistic Regression
(Reference Dependent Variable: "Not in Corrective Action")

Independent Variable Category	Reference Value for Independent Variable	Probability	Odds Ratio	Upper 95% Bound on Odds Ratio	Lower 95% Bound on Odds Ratio
Age of site greater than 60 years	Age of site less than/equal to 60 years	0.8879	1.083	3.295	0.356

Number of Sites in Each Corrective Action Category by Landfill Age (Greater Than 60 Years)



Percent of Sites Within Each Monitoring Status Category by Landfill (Greater Than 60 Years)



Variable Type for Statistical Analysis

Dichotomous Independent Variable

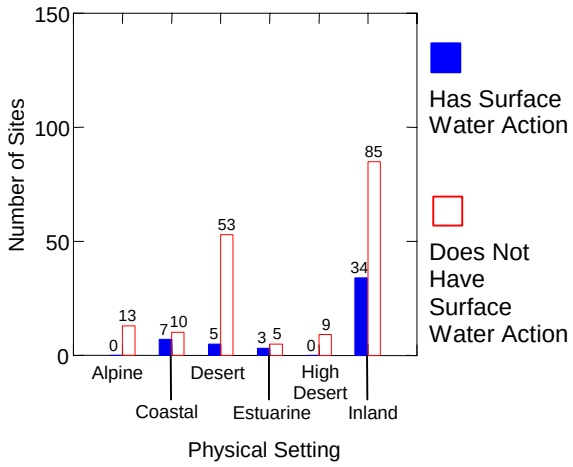
Results Statement

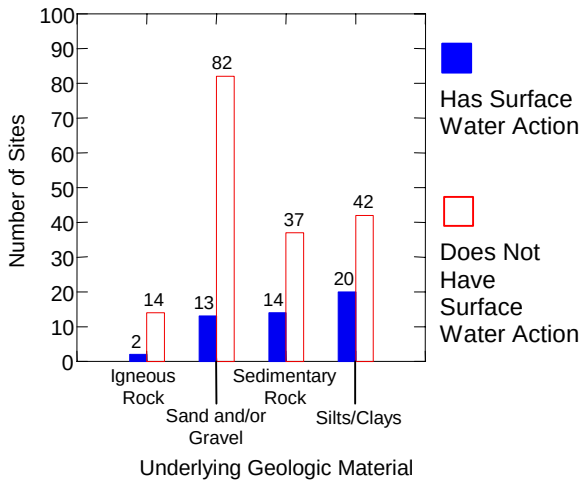
Whether or not a site is over 60 years old does not increase or decrease the likelihood of its being in the category "In Corrective Action."

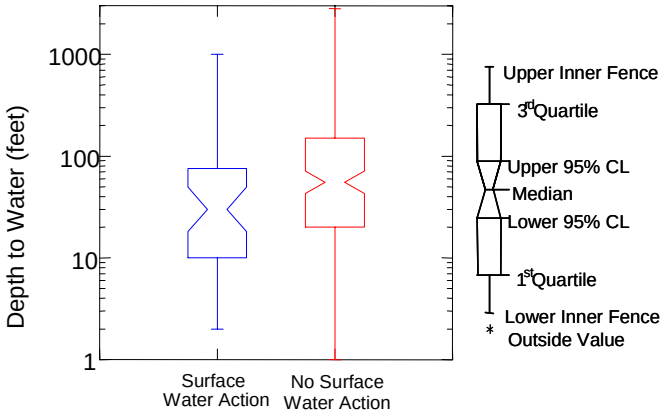
Appendix B-5:
Assessment of Individual MSW Landfill Site Characteristics by Surface Water Action

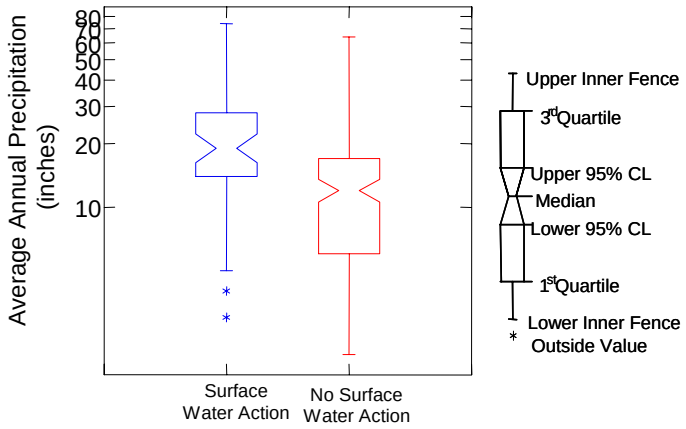
Summary of significant results from analysis of correlation between landfill site characteristics and surface water performance. See Section 4.1.5 for discussion.

Results statements in this appendix are based on the study's Task 2 database inventory, which contains data on the 224 MSW landfills studied.

Site Characteristic (Independent Variable)	**Physical Setting** **Value and Number of Landfills** Inland: 119 Desert: 58 Coastal: 17 Alpine: 13 High Desert: 9 Estuarine: 8
Environmental Performance	**Dependent Variable: Has Surface Water Action (Binary Values: "Has Surface Water Action" or "Does Not Have Surface Water Action")**
	Number of Sites in Each Surface Water Action Category by Physical Setting 
Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	It is approximately 4.2 times less likely that a desert site is in the category "Has Surface Water Action" than an inland site.

Site Characteristic (Independent Variable)	**Underlying Geologic Material** **Value and Number of Landfills** Sand and/or Gravel: 95 Silts/Clays: 62 Sedimentary Rock: 51 Igneous Rock: 16
Environmental Performance	**Dependent Variable: Has Surface Water Action (Binary Values: "Has Surface Water Action" or "Does Not Have Surface Water Action")**
	Number of Sites in Each Surface Water Action Category by Underlying Geologic Material 
Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	It is approximately 2.4 times more likely that a sedimentary rock site is in the category "Has Surface Water Action" than a sand and/or gravel site, and it is approximately 3 times more likely that a silts/clays site is in the category "Has Surface Water Action" than a sand and/or gravel site.

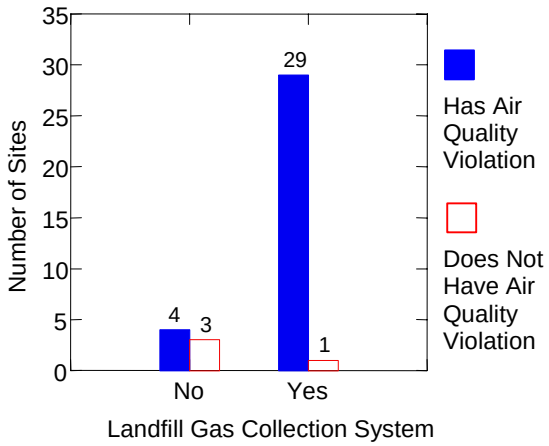
Site Characteristic (Independent Variable)	**Minimum Depth to Underlying Groundwater** **Value and Number of Landfills** Continuous
Environmental Performance	**Dependent Variable: Has Surface Water Action (Binary Values: "Has Surface Water Action" or "Does Not Have Surface Water Action")**
	Box and Whisker Plot of Surface Water Action Category by Minimum Depth to Underlying Groundwater 
Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	Minimum depth to underlying groundwater is statistically different (in this case, less) for sites in the category "Has Surface Water Action."

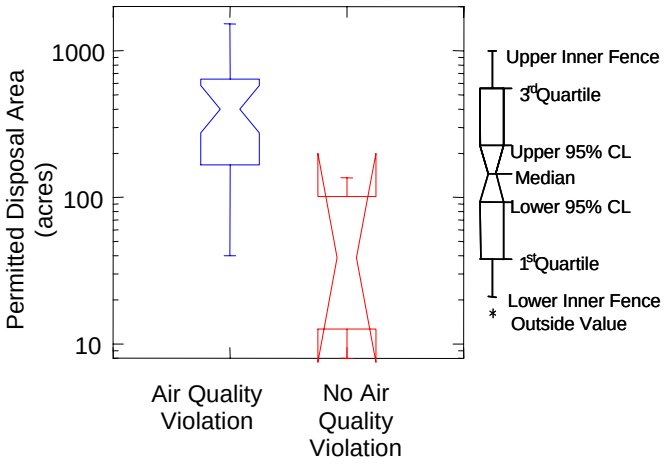
Site Characteristic (Independent Variable)	**Average Annual Precipitation** **Value and Number of Landfills** Continuous
Environmental Performance	**Dependent Variable: Has Surface Water Action (Binary Values: "Has Surface Water Action" or "Does Not Have Surface Water Action")**
	Box and Whisker Plot of Surface Water Action Category by Average Annual Precipitation 
Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	The average annual precipitation is statistically different (in this case, greater) for sites in the category "Has Surface Water Action."

Appendix B-6:
Assessment of Individual MSW Landfill Site Characteristics By Air Quality Violation

Summary of significant results from analysis of correlation between landfill site characteristics and air quality performance for South Coast Air Quality Management District (SCAQMD) and Bay Area Air Quality Management District (BAAQMD). See Sections 4.11.2 and 4.3.2 for discussion.

Results statements in this appendix are based on the study's Task 2 database inventory, which contains data on the 224 MSW landfills studied.

Site Characteristic (Independent Variable)	**Landfill Gas Collection System** **Value and Number of Landfills** Yes: 30 No: 7
Environmental Performance	**Dependent Variable: Has Air Quality Violation (Binary Values: "Has Air Quality Violation" or "Does Not Have Air Quality Violation")**
	Number of Sites in Each Air Quality Violation Category by Landfill Gas Collection System 
Variable Type for Statistical Analysis	Dichotomous Independent Variable
Results Statement	It is approximately 22.1 times more likely that sites with landfill gas collection systems are in the category "Has Air Quality Violation" than those that do not have landfill gas collection systems.

Site Characteristic (Independent Variable)	**Landfill Size (Permitted Disposal Area)** **Value and Number of Landfills** Continuous
Environmental Performance	**Dependent Variable: Has Air Quality Violation (Binary Values: "Has Air Quality Violation" or "Does Not Have Air Quality Violation")**
	Box and Whisker Plot of Air Quality Violation Category by Permitted Disposal Area 
Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	Permitted disposal area is statistically different (in this case, greater) for SCAQMD/BAAQMD sites in the category "Has Air Quality Violation."

Appendix C-1:

Analysis of Independence—Owner Type

Statistical analysis of data in the inventory shows that private sites are 2.37 times more likely to be in corrective action than public sites.

The correlation between *Owner Type* and "In Corrective Action" implies causation (with *Owner Type* influencing or resulting in whether the site is in corrective action). However, to better understand if the variable *Owner Type* is independent in its correlation with corrective action, the information was further analyzed.

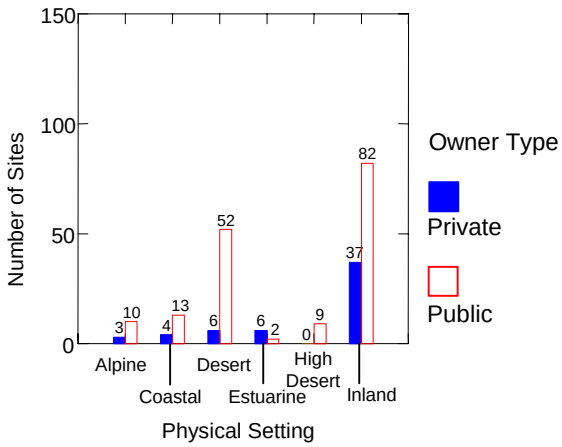
As discussed in Section 3.2.3, it appears that a handful of the landfill site characteristics designated as independent variables are, in fact, related to (and therefore dependent on) one or more other site variables. This potential correlation to other independent variables was examined for the variable *Owner Type* using logistic regression analysis. Complete results and graphical summary of this analysis are provided below.

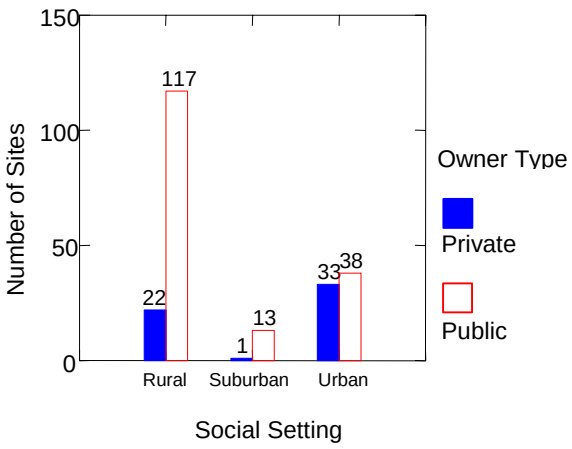
The following statements are based on qualification and analysis of these results:

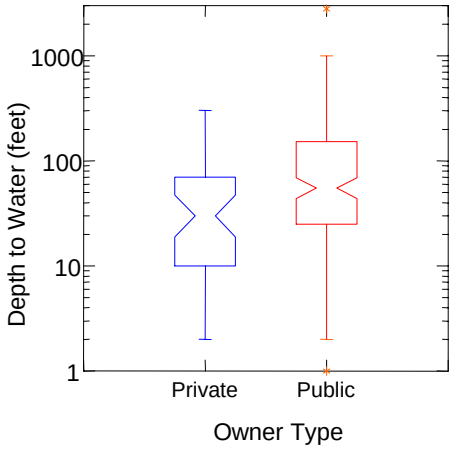
1. There appears to be some relationship between the estuarine physical setting and private ownership. However, this is not relevant to the single-factor analyses, since no significant correlation was found between the estuarine physical setting and any of the environmental factors.

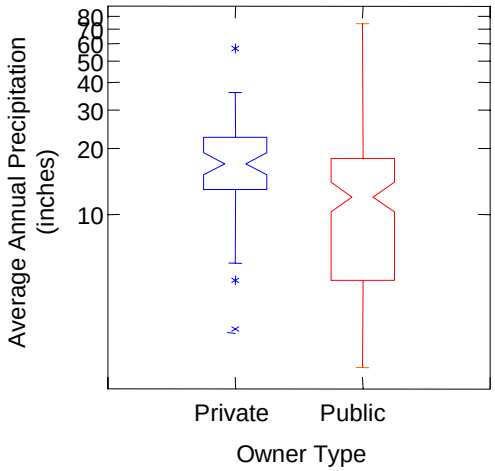
2. The correlation between private ownership and the status "In Corrective Action" noted in Section 4.1.2 may to varying degrees be due to the relationship between *Owner Type* and one or more of the following site characteristics: *Social Setting, Landfill Gas Collection System,, Liner Type, Landfill Size (Permitted Disposal Area)* and *Average Annual Precipitation*. The latter five variables also exhibited a positive correlation with the status "In Corrective Action" and with *Owner Type*.

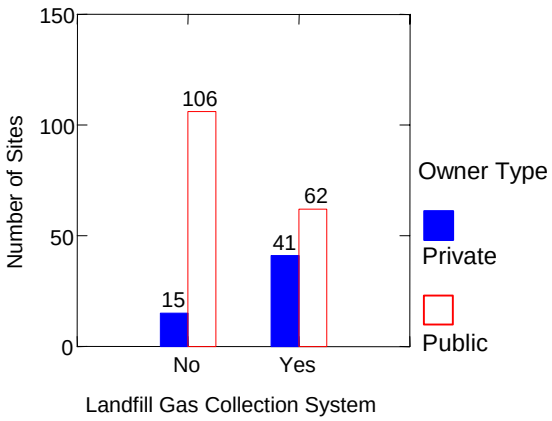
The analysis of the variable *Owner Type* indicates that, based on the available data, the following independent variables are correlated to whether a site is private or public:

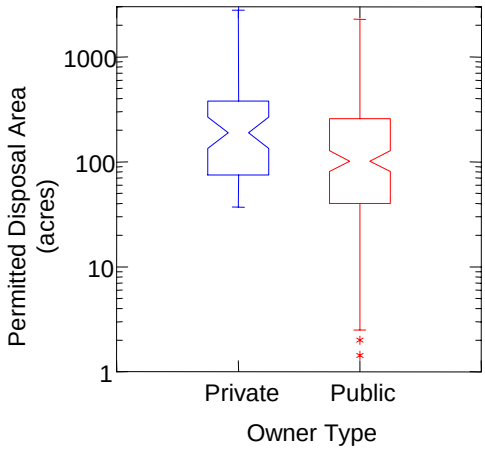
Site Characteristic (Independent Variable)	**Physical Setting** **Value and Number of Landfills** Inland: 119 Desert: 58 Coastal: 17 Alpine: 13 High Desert: 9 Estuarine: 8
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Number of Sites in Each Owner Type Category by Physical Setting 
Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	Desert sites are approximately 3.9 times less likely to be privately owned than inland sites, and estuarine sites are approximately 6.6 times more likely to be privately owned than inland sites.

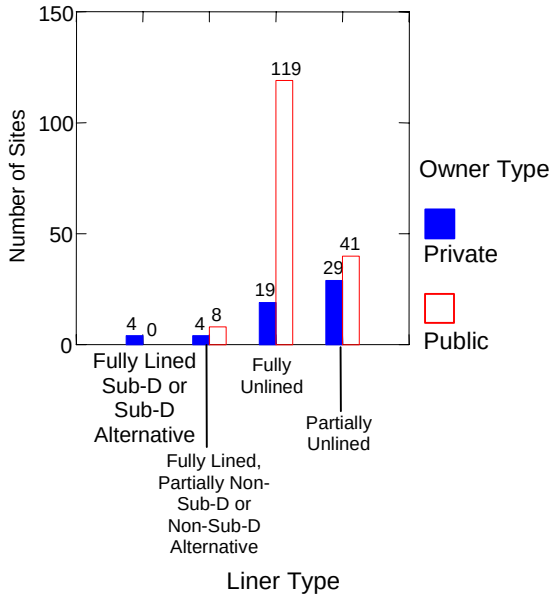
Site Characteristic (Independent Variable)	**Social Setting** **Value and Number of Landfills** Rural: 139 Urban: 71 Suburban: 14
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Number of Sites in Each Owner Type Category by Social Setting 
Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	Urban sites are approximately 4.6 times more likely to be privately owned than rural sites.

Site Characteristic (Independent Variable)	**Minimum Depth to Underlying Groundwater** **Value and Number of Landfills** **Continuous**
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Box and Whisker Plot of Owner Type Category by Minimum Depth to Underlying Groundwater 
Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	Depth to water is statistically different (in this case, less) for private sites.

Site Characteristic (Independent Variable)	**Average Annual Precipitation** **Value and Number of Landfills** **Continuous**
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Box and Whisker Plot of Owner Type Category by Average Annual Precipitation 
Variable Type for Statistical Analysis	Continuous Independent variable
Results Statement	The average annual precipitation is statistically different (in this case, greater) for private sites.

Site Characteristic (Independent Variable)	**Landfill Gas Collection System** **Value and Number of Landfills** Yes: 103 No: 121
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Number of Sites in Each Owner Type Category by Landfill Gas Collection System 
Variable Type for Statistical Analysis	Dichotomous Independent Variable
Results Statement	Sites that have landfill gas collection systems are approximately 4.7 times more likely to be privately owned than sites without landfill gas collection systems.

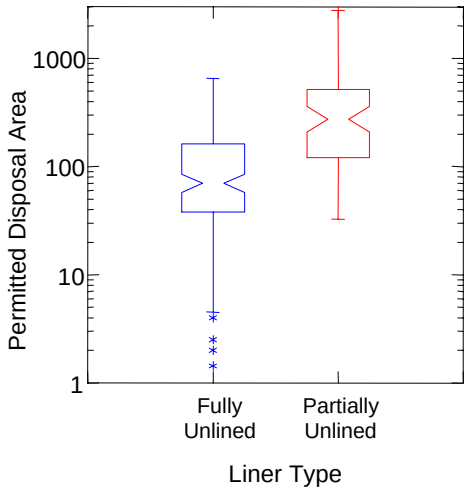
Site Characteristic (Independent Variable)	**Landfill Size (Permitted Disposal Area)** **Value and Number of Landfills** **Continuous**
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Box-and-Whisker Plot Owner Type Category by Permitted Disposal Area 
Variable Type for Statistical Analysis	Continuous
Results Statement	The permitted landfill area is statistically different (in this case, greater) for privately owned sites.

Site Characteristic (Independent Variable)	**Liner Type (Whole Site)** **Value and Number of Landfills** Completely Subtitle* D or Subtitle D Alternative: 4 Fully Lined – Partially Non-Subtitle D or Non-Subtitle D Alternative: 12 Partially Unlined: 70 Fully Unlined: 138 *Also referred to as "Sub-D."
Analysis of Independence	**Dependent Variable: Owner Type (Binary Values: "Private" or "Public")**
	Number of Sites in Each Owner Type Category by Liner Type 
Variable Type for Statistical Analysis	Categorical Independent Variable
Results Statement	Completely Subtitle D or Subtitle D-alternative sites are approximately 25.1 times more likely to be privately owned than fully unlined sites, and partially unlined sites are approximately 4.5 times more likely to be privately owned than fully unlined sites.

Appendix C-2: Analysis of Independence—Liner Type (Whole Site)

As noted in Section 4.9.2, partially unlined sites appear to be more likely to be in non-compliance with the respective environmental standards, whereas fully unlined sites do not exhibit such correlation. One suggested explanation for this outcome is that partially unlined sites tend to be large and relatively complex, thereby increasing the likelihood of non-compliance with certain standards. In the examples discussed in Section 4.9.2, non-compliance appears to be associated with larger sites, as defined by the variable *Permit Area*.

An analysis of possible dependence between *Liner Type* and *Permit Area* was conducted, looking specifically at the difference between partially unlined and fully unlined sites. The results, included in this appendix, provide some support to the hypothesis that landfill size may influence whether certain liner types are more or less likely to be in non-compliance.

Site Characteristic (Independent Variable)	**Liner Type (Whole Site)** **Value and Number of Landfills** Partially Unlined: 70 Fully Unlined: 138
Analysis of Independence	**Dependent Variable: Liner Type (Binary Values: Fully Unlined, Partially Unlined)**
	Box –Whisker Plot of Permitted Disposal Area By Liner Type (Whole Site) 
Variable Type for Statistical Analysis	Continuous Independent Variable
Results Statement	Based on the available data, the permitted landfill area for Partially Unlined sites is statistically different (in this case, greater) than Fully Unlined sites.

Appendix D-1: Additional Analyses—Two-Factor Landfill Site Characteristics Census

Number and percentage of whole sites designated in the database as Rural or Non-Rural, for each independent variable category. See Section 5.2.1 for discussion.

Site Characteristic	Social Setting	Number of Sites	Independent Variable Category	Number of Sites in Independent Variable Category	Percentage Within Independent Variable Category
Owner Type	Rural	139	Private	22	39.3
			Public	117	69.6
	Non-Rural	85	Private	34	60.7
			Public	51	30.4
Average Annual Precipitation	Rural	139	>= 14 in.	58	49.6
			< 14 in.	81	75.7
	Non-Rural	85	>= 14 in.	59	50.4
			< 14 in.	26	24.3
Liner Type	Rural	139	Unlined	106	76.8
			Lined	33	38.4
	Non-Rural	85	Unlined	32	23.2
			Lined	53	61.6
Physical Setting	Rural	110	Desert	50	86.2
			Inland	60	50.4
	Non-Rural	67	Desert	8	13.8
			Inland	59	49.6

Site Characteristic	Social Setting	Number of Sites	Independent Variable Category	Number of Sites in Independent Variable Category	Percentage Within Independent Variable Category
Minimum Depth to Underlying Groundwater	Rural	139	>= 34.5	77	68.8
			<34.5	62	55.4
	Non-Rural	85	>= 34.5	35	31.3
			<34.5	50	44.6
Landfill Gas Collection System	Rural	139	Yes	37	39.4
			No	102	78.5
	Non-Rural	85	Yes	57	60.6
			No	28	21.5
Landfill Size (Permitted Disposal Area)	Rural	139	>= 122 acres	49	43.4
			< 122 acres	89	80.9
	Non-Rural	85	>= 122 acres	64	56.6
			< 122 acres	21	19.1
Landfill Age	Rural	139	>= 35 years	57	50.4
			< 35 years	82	73.9
	Non-Rural	85	>= 35 years	56	49.6
			< 35 years	29	26.1